

MODERN Machine Shop

HOWARD CAMPBELL, Editor

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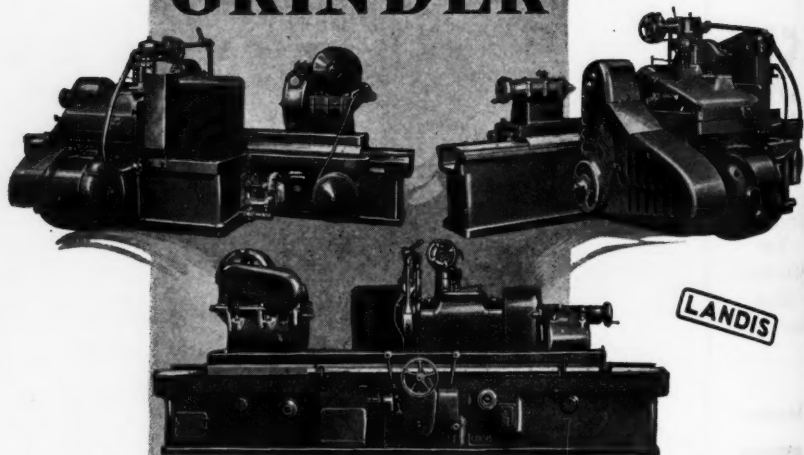
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MODERN Machine Shop

CINCINNATI, OHIO

VOL. 6, No. 7

DECEMBER, 1933

Jigs and Fixtures Born in the Scrap Pile

BY A. F. DAVIS

Vice President, The Lincoln Electric Company, Cleveland, Ohio

AS a toolbuilder's tool, the electric arc is limited only by the ingenuity of the user. The flexibility of the electric arc process, its simplicity and its very obvious economy recommend it to every modern machine shop.

In the construction of special tools, jigs and fixtures, one advantage alone of arc welding makes it outstanding; that is, complete jigs and fixtures can frequently be built from scrap material.

The chief requisites in the manufacture of jigs and fixtures are accuracy and rigidity; that is, they must be so constructed that the piece being machined can be held rigidly, thus making it possible to machine it accurately. The adaptation of the electric arc welding process to the manufacture of jigs and fixtures has enabled the producers to build both accuracy and rigidity into these products, and at the same time bring the manufacturing costs down to a more favorable figure.

The traditional way of producing jigs and fixtures is by casting them,

or, as in the case of more simple units, to machine them from large pieces of steel. Both of these methods are comparatively long-drawn-out affairs and in most cases, very expensive ones. In casting a design, it is necessary to make drawings and patterns and to machine the unit after it is cast. Very often it is also necessary to bolt on other pieces to obtain the proper rigidity and accuracy. Simpler pieces cut from steel billets take more time in proportion to their details than they would if constructed of arc welded steel. This modern process permits more simplified construction and consequently lower production costs.

In order to show how small scrap parts can be cut, fused together by welding, and assembled into jigs or fixtures, let us consider several common applications of machine parts as they may be built by welding.



Fig. 1—A boss consisting of a section of round bar stock welded to the supporting member.

Among the common elements are bosses, bearing supports, levers, pins and clevises. Bosses may be applied in several ways depending upon their functions. In Fig. 1 the stud boss

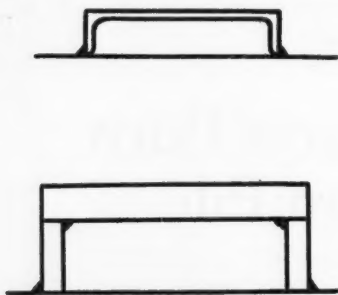


Fig. 2—Two methods of using welded bosses as mounting pads

consists merely of a piece of round bar stock or shafting, fused to the supporting member by a fillet weld, as shown. If tapped as indicated, it may serve as a stay rod connection or may support a slotted bar used for adjustment purposes.

A boss may serve as a pad to provide mounting. Bosses may be built in many different ways. Fig. 2 shows

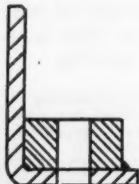
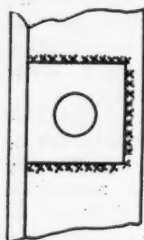


Fig. 3—A design for a boss used for hold-down bolts on a plate

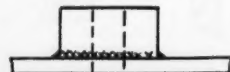


Fig. 3. The boss allows maximum accessibility and clearance for wrenches.

Illustrative of how fairly complicated parts may be built up by cutting and welding small scrap parts is the lever shown in Fig. 4. It consists essentially of a tube or pipe, around which is fitted some flat stock which has been punched at one end and bent, these operations occurring after it has been cut to shape. The lever is symmetrical about the center line and has considerable stiffness in both directions. The attachment to the tube or the general scheme of attachment may be varied as required.

Clevises are often used with pin connections in lever mechanisms.

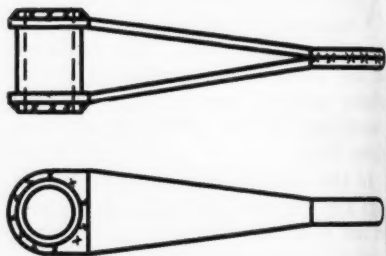


Fig. 4—Design for an arcwelded lever

When clevises have a screwed connection with lever bars they provide a means of adjustment for the leverage system. Most always forged or cast clevises have screwed connections with lever bars even when provision for adjustment of the lever system is not required, which means that when the lever bar is other than round in section it must first be machined round for threading.

Levers of round section must also be threaded for connection. When provision for adjustment of the lever mechanism is not required, a forged or cast steel clevis may be easily arcwelded to a lever without the machining operations of drilling, reaming and

threading either clevis or lever for the connection.

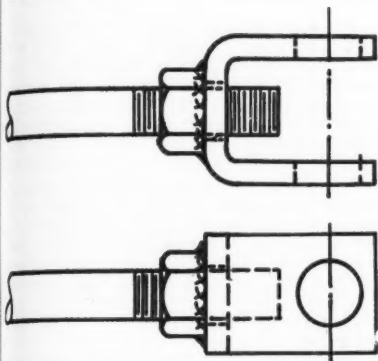


Fig. 5—An ingenious method of building a clevis by welding

A clevis may be formed by bending a piece of flat bar stock into U-shape as illustrated in Fig. 5. If it is desired to have a threaded connection with its lever bar, this may be provided without drilling, reaming or threading the clevis by the simple expedient of welding a nut to the bottom of the clevis as shown.

In such cases where a threaded connection must be used as means of adjusting the lever system, the clevis may be drilled (not threaded) to allow extensive adjustment of length of the lever bar. By welding two pieces of plate in parallel on opposite sides of a lever bar a simple clevis may be

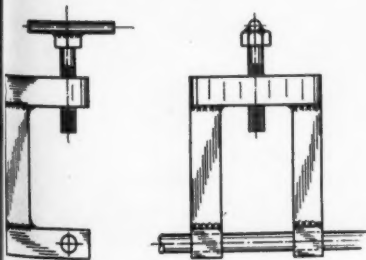


Fig. 6—Welded hold-down clamp.

formed. The lever bar may be round or have flat sides.

Pins for connections in leverage systems may be made by arc welding a washer to a piece of round bar stock. Or a bar or a nut may be welded to the round bar stock.

In the building of jigs many hold down clamps are frequently necessary. A simple one which operates on a cam is shown in Fig. 6. No special parts are necessary, and no machining is required. The material can be obtained from the scrap heap.

As is evident, the construction of most jigs and fixtures is largely a

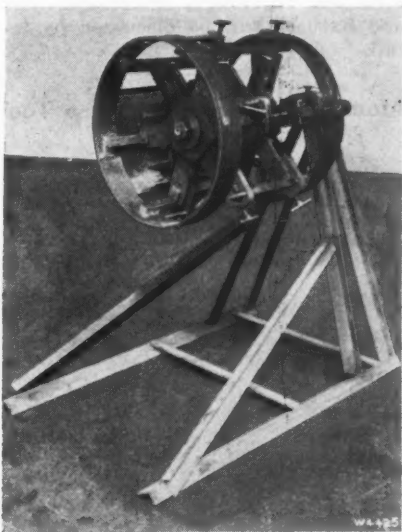


Fig. 7—Motor frame welding fixture built entirely by arc welding. The motor frame is shown in position.

matter of utilizing many small devices such as those shown here and applying them to the particular problem. In Fig. 7 may be seen a collapsible fixture for welding motor frames, with the frame in place. The entire fixture is arc welded. The base is an arrangement of angles and bars.

The fixture itself consists of a dou-

ble spider with 12 arms, and is made of welded construction throughout. It rotates on an axle so that welding may always be done in a down hand position. Many scrap parts were used and only a minimum of machining was required. The cam-operated clamps are equipped with stops for proper placement of the ring frames. This fixture is so designed as to allow no more than 1/100 inch variation in the dimensions of the completed wedged motor frame.

In the second part of this article, which will appear in the next issue of MODERN MACHINE SHOP, the construction of several interesting jigs and fixtures will be discussed in detail.

Monarch Announces Machine Tool Exhibition

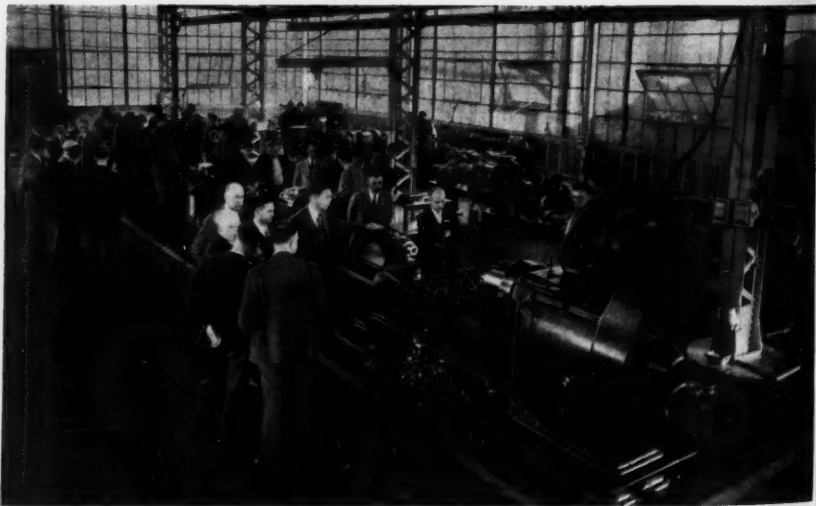
The Monarch Machine Tool Company, Sidney, Ohio, recently completed development work on a number of radically new machines and improvements. These new items include the new Monarch Toolroom Surface Grinder, the Magna-

Matic Full Automatic Lathe, the Cam Milling Attachment, and other new Monarch developments.

In view of the wide-spread interest that is being shown in these new machines, the Monarch management has decided to establish a permanent demonstration division. All the new Monarch machines, as well as a representative selection from the present Monarch line, will be exhibited and demonstrated here.


An invitation is extended to engineers, executives, and all who may be interested to attend the permanent Monarch exhibition at the Monarch plant, at Sidney, Ohio. Already a number of large groups from various sections of the country have visited the Monarch plant and have seen the new units, several of which have not as yet been announced to the trade in general. The illustration shows one of the groups watching the performance of the machines in operation.

The machines mentioned above—and any others which may be developed—are set up in this demonstration division, where they are operated under power under exactly the same conditions that will be encountered in the average modern plant. Typical work-pieces are machined under the observation of interested visitors so that prospective users may learn from their own observation exactly what the machine or tool is capable of.



Group of production executives inspecting the latest Monarch developments at the Monarch permanent exhibit in Sidney, Ohio.

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Storing Materials at the Job

Modern material-handling equipment makes possible the decentralization of material stores and assures adequate distribution to operators

BY FRANCIS A. WESTBROOK, M. E.

CONSIDERING the size of the plant and the number of men normally employed, the plant of the Lewis-Shepard Company, at Watertown, Massachusetts, turns out a surprisingly large volume of production. This fact becomes the more outstanding when it is known that a high degree of standardization is impossible because so many of the firm's customers demand equipment designed to fit conditions that are peculiar to their own plants or their industries.

Strangely enough, perhaps, these very demands contribute in a large measure to the unusual efficiency of the Lewis-Shepard plant, because the same ingenuity that is employed in ironing out the customers' difficulties is very naturally exercised in solving the Lewis-Shepard Company's own production problems.

This company manufactures lift

trucks, mechanical stackers, skid platforms, and racks for the storing of materials. In order that these units may be best adapted to the materials that are to be handled or to the conditions under which they are to be used, various details of design must be altered in accordance with the customers' specifications.

This procedure complicates the manufacturing processes and develops conditions which must be overcome in order to operate on an efficient basis, not the least of which is the matter of materials storage. In this article the author proposes to deal with the methods employed in the storing of materials in this plant. The methods used in handling the materials are also discussed, as it appears that the two subjects are inseparable.

The Watertown plant of the Lewis-Shepard Company is of one-story con-

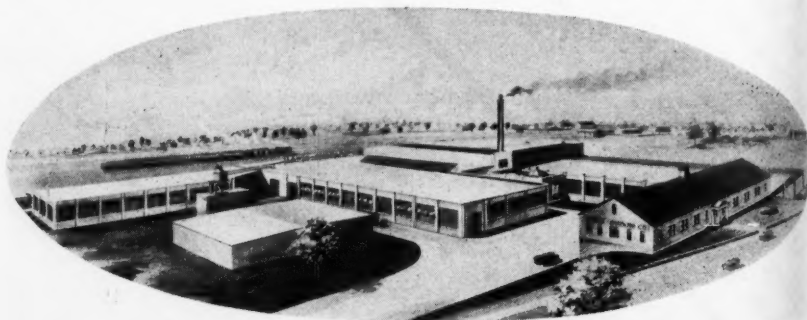


Fig. 1—Watertown Plant of the Lewis-Shepard Company

struction, and the main building, in which the principal manufacturing operations are carried on, is arranged as shown in the layout drawing Fig. 2. Inasmuch as it is strictly a metal-working plant, the equipment includes the usual complement of machine tools, plus a very considerable amount of electric welding equipment. The full possibilities of the arc welding process are taken advantage of in this plant, and in all cases where permanency of construction is desired, the arc welding method is used.

Raw materials are delivered at the receiving room, indicated on the layout drawing, where they are handled according to their nature. If they consist of parts shipped in bulk, such as castings, they are probably brought to the plant by the company's own truck, in which case the trucker takes along a lift truck and platform bins when he starts out to bring them from the freight station, foundry, or elsewhere. Loading platforms at such places are usually of approximately the same height as the truck; thus it is an easy matter to load castings into the bins and move them onto the truck with

the lift truck. Other materials may be placed on ordinary skid platforms and handled in the same manner.

When the truckload of material returns to the plant, it is backed up to the raw materials receiving room door where, because the floor is the same level as the driveway, the materials are unloaded by means of a permanently-placed, electrically-operated stacker. This stacker is shown in operation in Fig. 3. The loaded bins or skid platforms are moved onto the stacker with the lift truck, when nec-

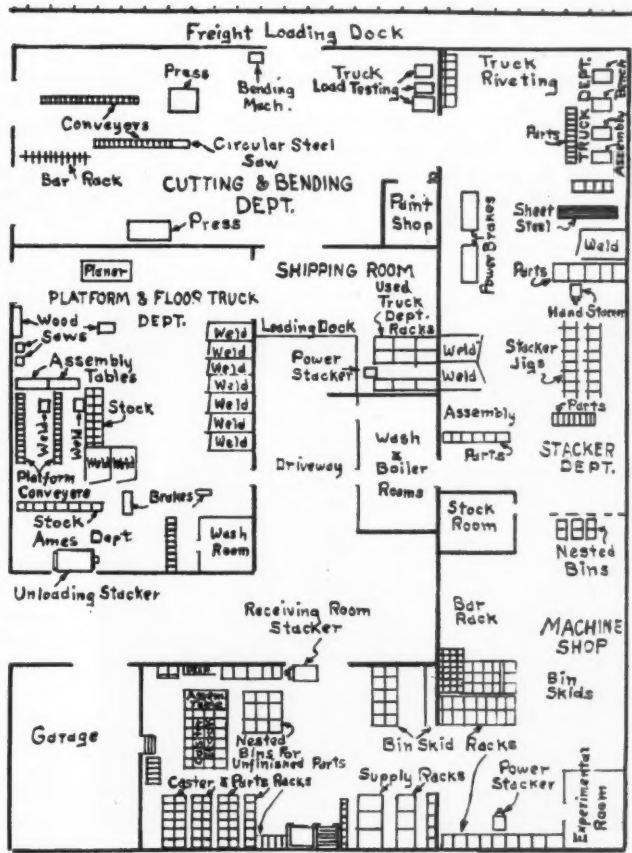


Fig. 2—Layout Plan of Lewis-Shepard Plant

essary, and the load is lowered to the floor where it is again picked up with a lift truck and moved to the point where it is to be used. All rehandling is avoided.

It is at this point that the unusual method of storing becomes apparent. As far as possible, racks and bins for materials storage are located as closely as possible to the departments, benches, or machines where the ma-

of wheels arrives, the various sizes of wheels are placed in metal bins or boxes with skid bottoms and are immediately moved to their allotted positions on the racks in the truck assembly or stacker assembly department, as the case may be. The handling is done with a stacker of the type shown in Fig. 4 or 5, as required.

A comparison of these two types of stackers will indicate an interesting development that has taken place in this shop. The stacker shown in Fig. 4, which is a hand-operated machine, was used for this work for a long time. Finally, however, the number of storage racks was increased to such a point that higher stacking became necessary and then it became necessary to substitute the telescopic stacker illustrated in Fig. 5. The telescopic feature makes it possible to move this stacker through doorways, under beams, and into rooms with low ceilings without difficulty. This stacker has since been motorized, increasing the speed of operation, eliminating hand-cranking, and alto-



Fig. 3—A stacker is permanently located at the receiving room door. The stacker makes it possible for one or two men to load or unload a truck of heavy materials.

terials are to be fabricated, so that continuous supplies of raw materials will be available. The racks and bins for this purpose are especially designed to accommodate the particular parts or materials for which they are intended, and, moreover, are so constructed that the containers or platforms can be handled into and out of position by means of stackers or lift trucks.

For instance, when a consignment

gether increasing the efficiency of the unit.

Parts are handled back and forth between departments in the manner described above. As parts are made up in the assembly departments, or in the welding booths, they are moved to the departments in which they are to be used. A point is made of providing sufficient storage space at each assembly department so that the rehandling of materials to and from a

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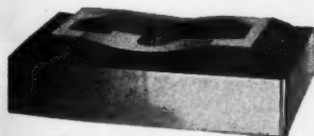
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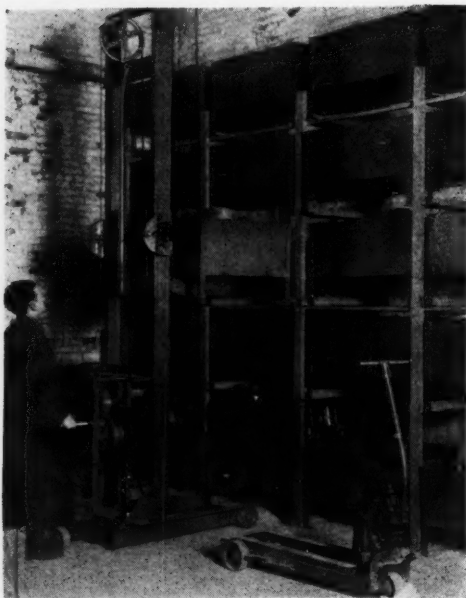


Fig. 4—Using a hand-operated stacker to place boxes of castings in a rack.

with the duty of maintaining an inventory of such materials so that orders for new materials may be placed in time to prevent tie-ups due to lack of parts. The parts used in the building of the material-handling units which constitute this firm's product are not of such character as to invite pilfering; thus it is not necessary to keep them under lock and key, and this condition is by no means peculiar to this shop.

By placing the racks parallel with the aisles, wherever possible, plenty of room in which to operate the stackers or tying machines is assured and the amount of space required is kept at the minimum. Space otherwise wasted is utilized, and space that in most plants is used for a single tray of stock is, in this plant, occupied by a

central storage point, such as the usual stock-room, will be avoided. In the last analysis, no more floor space is required for storage and a considerable amount of handling is eliminated.

The usual receiving room records, inspection records, and records of materials placed in production; i.e., moved to the points where they are to be processed, are kept in the same manner that they would be kept if the materials were concentrated in one place. The foreman of each department is held responsible for the materials that are stored in his department and he is charged



Fig. 5—A power-operated, telescopic stacker makes it possible to load trays into the highest tier of a high rack.

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Fig. 6—A tier of shelf-type racks with assembly units stored in the upper sections. All trays except the bottom ones are handled with the stacker shown at the right.



tier of trays reaching well toward the ceiling.

Practically everything in the plant that may be classified as "materials" is placed on a skid platform as soon as it

is received, even though the chance that it may be moved about is remote. All junk and scrap is loaded into boxes with skid bottoms, making the handling easy and thus saving time and labor. The decentralization of the material stores, as outlined in

this article, will be found feasible for many plants and a study of the possibilities will show that, wherever this system is possible, non-productive labor costs can be lowered, there will be less damage to materials, and the efficiency of the plant increased.

New Norton Grinders To Be Shown At Exhibit

During the week of December 4, Norton Company, Worcester, Massachusetts, will hold an interesting and educational exhibit at the factory, where the following new items will be shown:

1. A motorized tool and cutter grinder.
2. A small hydraulic surface grinder with automatic cross feed.
3. A new line of cylindrical grinders known as Type C.
4. The Nortonizer, which is an automatic electric sizing device.
5. A new crankpin grinder known as the D-85.
6. The Cam-O-Matic.

In addition, a large roll grinder, a car wheel grinder, and new 10-in. Type D cylindrical grinder, and a new lapping machine will be shown. All of these machines will be set up and operating under power, and will be demonstrated to a group of Norton salesmen, dealers, and prospective customers. The six items listed above are described in the New Shop Equipment Section of this issue, beginning with page 34.

"THE ALLOY POT" is the title of a monthly 4-page bulletin that is issued by The New Jersey Zinc Company, 160 Front St., New York, N. Y., in which is published information concerning the latest developments in die casting processes and materials. Each issue contains descriptions of parts that are now being made by the die casting process, with data as to costs, advantages obtained, and so on. The Vol. 1, No. 6 issue carries a valuable table of properties of die cast "Zamak" alloys. "The Alloy Pot" will be sent without charge to mechanical executives.

PERCUSSION POWER PRESSES. Patent percussion power presses for hot pressing brass and other non-ferrous metals, for cold pressing of steel parts, and for press forging of heavy parts are shown, with specifications, in a bulletin that is being put out by the Zeh and Hannemann Co., Newark, N. J. A variety of the different types of presses made by this firm are described. Copy free upon request.

An Inexpensive Dust Control System

BY HOWARD GLOVER

SHOPS equipped for sandblasting or other operations where the removal of excessive dust is required are often handicapped by the high cost of elaborate dust control systems. Where absolute confinement of dust is not essential inside the shop as long as it can be confined within a certain area outside, the system described here will prove sufficient.

Dust, to be controlled, must first be kept within a given space. In sandblasting where excessive dust is created, the work is usually carried on in a room in which the operator stands. Any other operation that creates dust should be done in a room from which the dust can be removed by forced ventilation.

The size of the room required depends entirely on the type of work. The figures given in this article are for a room 10 feet wide, 15 feet long, 10 feet high. All dimensions are relative and can be modified according

to the size of the room and the exhaustor or blower fan used.

The room can be made of rough lumber or composition board. If it is used for sandblasting or any operation in which there is an abrasive action against the walls, it is well to cover them with old inner tubes. An effective resistant can be made by soaking flake or chip glue in water, adding ten per cent of glycerine, then heating to about ninety degree Fahrenheit. Enough water is added to give the solution the consistency of thick paint. It is applied while warm with a brush and will need but an occasional renewal.

At one end of the room cut two holes, 12 inches square, in the wall at a point six feet from the floor, to provide an intake for fresh air. The holes should be covered with wire screen to prevent the entrance of foreign particles. At the opposite end, in the ceiling, cut two round

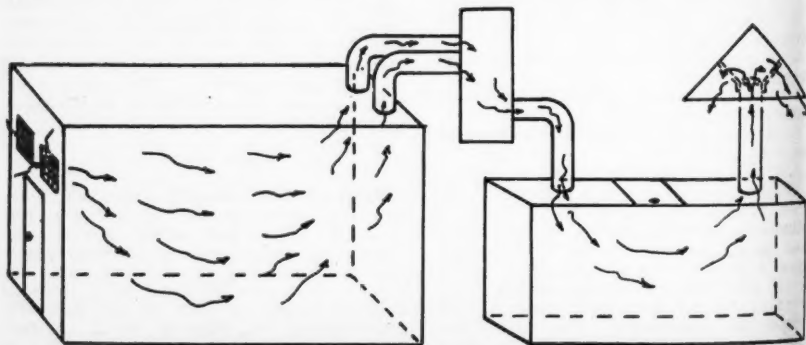


Fig. 1—Drawing illustrating path of air from entrance into sandblast room through exhaust pipe and out through cone-hood.

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holes to admit 12-inch diameter galvanized pipes. Extend the pipes an inch or two below the ceiling and seal around the edges to prevent dust

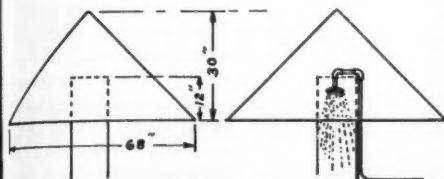


Fig. 2—(Left) Dimensions of cone-shaped hood. (Right) Illustrating method of attaching water spray in top of tank exhaust pipe.

leakage into the shop. These are the room air-exhaust outlets.

The air-exhaust outlets run into the intake pipe of the exhaustor fan, which can be located on top of the room or elsewhere. A room of the size described can use an exhaustor with 12-inch diameter intake and exhaust pipes. From the exhaust or outlet side of the exhaustor run a galvanized pipe into a water tank, which sets outside of the shop. The tank can be made of wood, six feet long, four feet wide and four feet high. It should be lined with galvanized metal soldered at the joints to prevent air and water leakage. A sliding airtight panel in the top makes the tank accessible for cleaning. A 24-inch diameter galvanized pipe, three feet high, at the opposite end allows the air to escape. A cone-shaped hood fastened to the top of the pipe, far enough away to avoid back pressure, will divert the air-stream downward.

A water line up the side of the tank exhaust pipe to which is attached a fine spray will help to saturate the dust that escapes. It can be adjusted to keep the water at the proper level. The tank should be kept about half full of water; experiment will determine the correct level.

When the system is in operation, dust enters the tank where most of it is precipitated into the water. What little escapes through the tank exhaust pipe is deflected downward by the cone-shaped hood. The spray wets the dust and it will drop to the ground within a few feet or fall back into the tank.

If climate does not permit the use of water in the tank, a series of baffles such as shown in Fig. 3 can be made by fastening burlap or muslin to wood frames. It is best to pro-

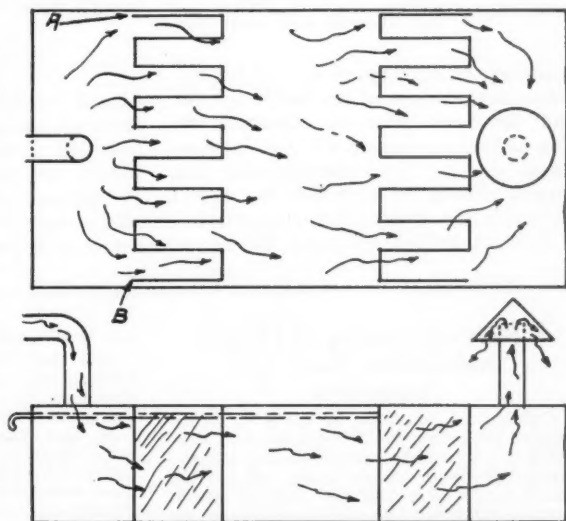


Fig. 3—Drawing of tank. Arrows indicate course of air through cloth baffles. Lines from "A" to "B" indicate continuous line of cloth on upright frame. By agitating the shaker rod, the dust is shaken from the cloths.

vide the tank with a removable top so the baffles can be taken out if necessary. If their use produces back

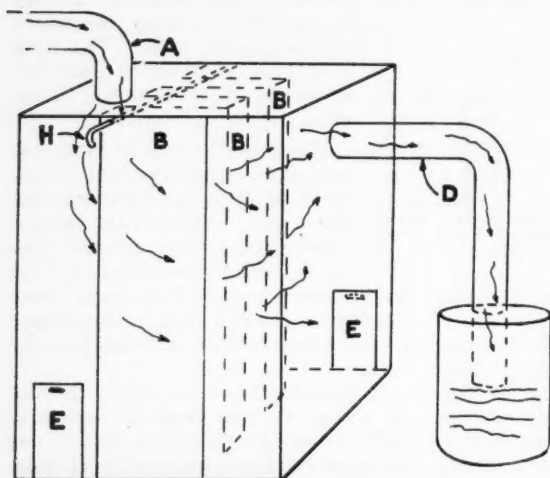


Fig. 4—Arrows indicate the course of the air through the eliminator. A—Pipe from exhaustor. B-B-B—Cloth baffles through which air passes from A to D. E—Slide doors for removal of accumulated dust. H—Shaker rod. D—Pipe from dust chamber into water barrel.

pressure, enough space should be left between the edges of the baffle frames and the tank sides to eliminate it. The baffles or screens will require frequent shaking to avoid clogging and means should be provided by a rod to which the frames are connected.

If cloth baffles are used, the shape

of the tank can be varied. The tank can never be too large, but it can be too small. An efficient size for a cloth dust arrestor would be eight feet in length. The baffles would be correspondingly large and the cone-shaped hood and large exhaust pipe would not be needed. Figure 4 shows the arrangement for a dust arrestor of that type. The angles of the frame should be spaced about four inches apart and the baffles should be about three feet in width to leave space for dust passage.

The exhaust pipe "D" should be the same diameter as the intake pipe "A." If this type of dust collector is used it can be kept inside the shop provided it is air tight. Only the exhaust pipe need be placed outside where the small portion of escaping dust can be confined to a water barrel. If enough baffles are inserted and covered with the proper material, little or no dust will escape and the barrel can be done away with entirely.

S. S. White Catalog of Flexible Shaft-Driven Tools and Equipment

Catalog TA, is issued by the S. S. White Dental Mfg. Co., 150 West 42nd St., New York, N. Y., comprises practically a complete handbook on the design of flexible shaft equipment and the uses to which such equipment may be advantageously put. The different sizes of "Flextools", as they are called, are illustrated and complete information is given concerning the ratings and amounts of power used, speeds of operation, sizes of flex-

ible shaft, and other features.

The text includes descriptions and illustrations of flex-arms, couplings for attaching the flex-arms to the motor, handpieces, burring tools, drills, rotary files, and abrasive tools in both points and wheels. By adopting flexible shaft equipment, practically all hand work on dies, tools, or parts can be eliminated. Filing and fitting operations can be performed easily, rapidly, and accurately by power.

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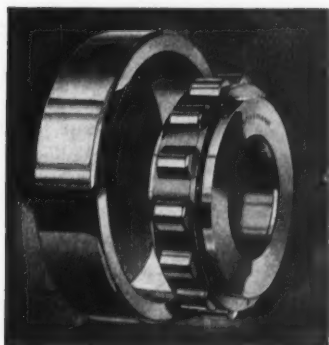
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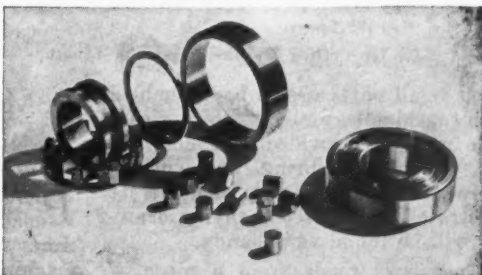
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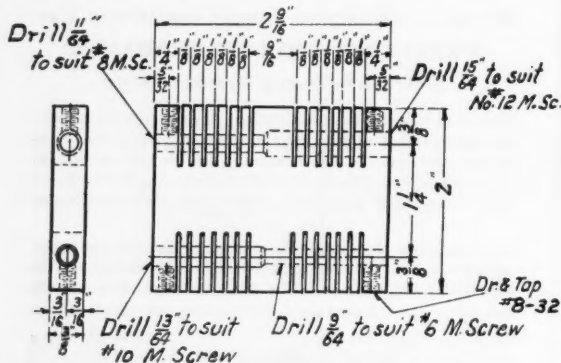
IDEAS FROM READERS

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Jig for Sawing Machine Screws

BY J. A. MILLER

THERE are times when, for one reason or another, it is found difficult to use standard length machine screws. Such an instance occurs



Jig for Cutting Machine Screws to Length

when small parts are to be assembled with machine screws for which clearance must be provided. To simplify the job of measuring and cutting screws to the length required, the jig illustrated in the accompanying drawing will be found very handy.

The jig is made from a piece of $\frac{3}{8} \times 2$ in. steel, $2\frac{1}{8}$ in. long. Four different sizes of holes are drilled in the ends of the block, two in each end, to take the four most commonly used sizes of machine screws: Nos. 6, 8, 10, and 12. The holes should be near the exact sizes of the screws as possible. To provide for locking

the screws in position, four No. 8-32 thd. screws are positioned in the sides of the block near the ends as shown. This done, slots just wide enough to take a hacksaw blade are cut in the sides of the block, the first $\frac{1}{4}$ in. from the end and the rest at $\frac{1}{8}$ in. intervals.

When a screw is to be cut to an odd length, only a couple of seconds is required to insert the screw into the proper hole in the block, lock it in position, and clamp the block in a vise. A hacksaw does the rest, and without the constant fear that the screw is going to jerk out of the vise and perhaps break a saw blade. The same idea may be applied to bolts and cap screws.

A Machine for Graduating Collars

BY AVERY E. GRANVILLE

PRACTICALLY every machine made has at least one, and sometimes several, graduated collars. The machines or devices used in the graduating of the collars are, in almost every instance, made by the manufacturers of the machines on which the collars are used. While the general principle on which the graduating devices are designed is practically the same, yet of the scores of such machines that I have seen I have never

seen two alike. Each designer follows ideas of his own, or varies the construction to suit some special size, shape, or angle.

The graduating machine shown in Fig. 1, while made for a single type of collar with slight variations in diameter, is of an especially neat and workman-like design, and with perhaps slight changes it can be adapted to a wide range of work.

The collar to be graduated is held at A on the end of a spindle which also serves as the shaft for the worm wheel F. The collar is indexed for the successive graduations by the movement of the connecting rod B, operating the pawl C and thus forcing the ratchet wheel D to turn the worm E, transmitting motion to the worm gear F.

The connecting rod B gets its intermittent movement for the indexing from the sliding bar G, through the sliding arm H, which is bolted to the slide I, and thence through the short connecting rod J to the hand lever K. The two stop collars L, on the bar G, are so set that the sliding arm H will only move the indexing mechanism when the graduating tool is clear of the work. The other two stop collars, located near the ends of the bar, are to limit the stroke of the hand lever.

The graduations on the collar A consist of four short and one long mark alternating around the circumference. The cutting tool is held at M, in a holder that is pivoted at the

rear end to the front slide O. The spring P keeps the toolholder down on the cutting stroke, but allows for tool relief on the return stroke. This front slide is joined to the lever-operated slide I by the connecting rod Q, which is slotted at its front end to allow of a limited amount of play

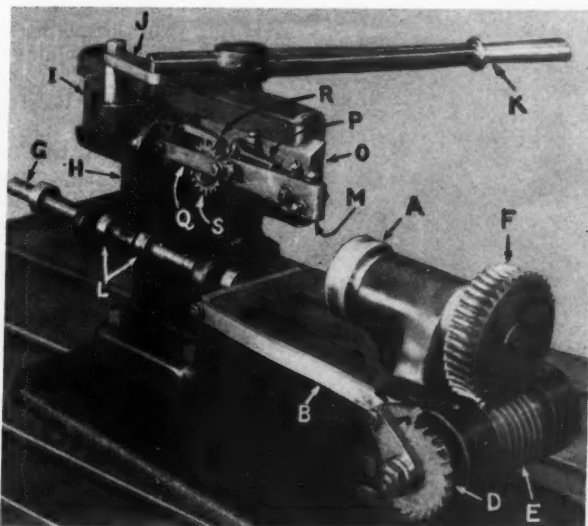


Fig. 1—Machine for Graduating Collars

between the two slides as the hand lever is moved forward and back.

At each complete movement of the hand lever, the pawl R moves the wheel S one tooth. It will be seen that this wheel has four short and one long tooth alternating around the periphery. These teeth govern the length of stroke of the tool slide and consequently the length of the marks as they are cut on the collar being graduated. This is accomplished by having the hardened pin T, Fig. 2, set in the front end of the rear slide. Each tooth in the wheel S is brought, in turn, opposite this hardened pin;

thus as the hand lever is operated, the hardened pin butts against a tooth of the wheel S and moves the front slide with its cutting tool according to the length of the tooth that is in line. The reason for slotting the front end of the connecting rod Q will now become plain, since without it, it would not be possible for the

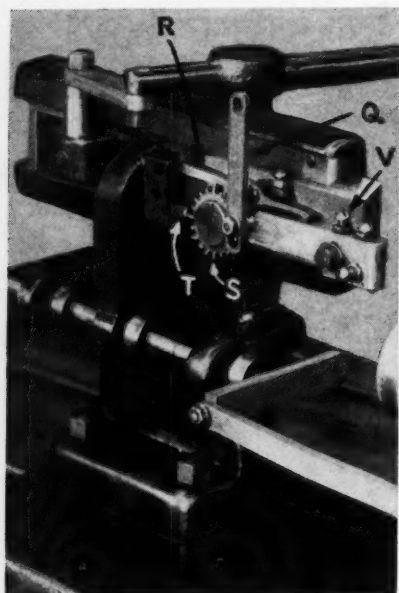


Fig. 2—Here the rod that connects the front and rear slides has been disconnected to show the stroke-governing mechanism more clearly.

pawl R to move the wheel S one tooth at each complete stroke, nor for the different lengths of teeth to come in line with the hardened pusher pin T.

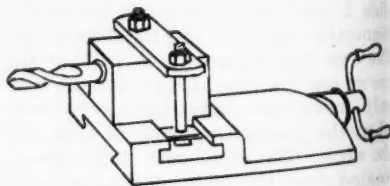
A vertical slot at the front end of the toothholder, through which the shoulder screw is placed, allows of a certain amount of vertical movement of the tool. The setting of the cutting tool for the proper depth of cut is done by turning the setscrew V, which butts onto the shoulder of the screw in the slot.

R Drill Blocks for the Engine Lathe

BY FRED W. DOUGHERTY

SMALL jobbing machine shops are not always equipped with turret lathes, or if such a shop has one or two turret lathes, the lathes are so constantly in use that more or less drilling and reaming must be done in the engine lathes. The usual method of holding a drill in the engine lathe is, of course, to hold the drill on the tailstock center, with a dog clamped to the drill and resting against the carriage to prevent the drill from turning, and feed the drill into the work by means of the tailstock handwheel. Every mechanic who has had to drill holes in this manner day after day will, however, agree that it is not only a tiresome and man-killing job, if the drill is large enough, but is also slow and hard on the machine.

As the lathe jobs that required drilling were quite frequent, we made up a set of steel blocks in which the drills could be mounted and which could be clamped to the compound rest of a lathe, as shown in the illustration. Each block was bored to fit a No. 4 taper sleeve and milled on the bottom to leave a tongue which fitted into the slot in the rest so as



Drill Block for Engine Lathe

to take the thrust. By setting the rest parallel with the ways of the lathe, a hole in a piece of work could be drilled easily and accurately.



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By using these blocks we found that work could be drilled in approximately half the time required by the old method, as the operator could concentrate on drilling, rather than on keeping his carriage in just the right position to support the tail of the dog and on keeping his tailstock center tightly against the work to avoid the possibility of breaking it and spoiling the work. Also, the holes were smoother and more uniform in size.

A number of other uses have been found for this block, and as it only takes a few seconds to set up, it can be used to advantage where only a few pieces are to be machined.

A Unique Bending Die

BY CHARLES KUGLER

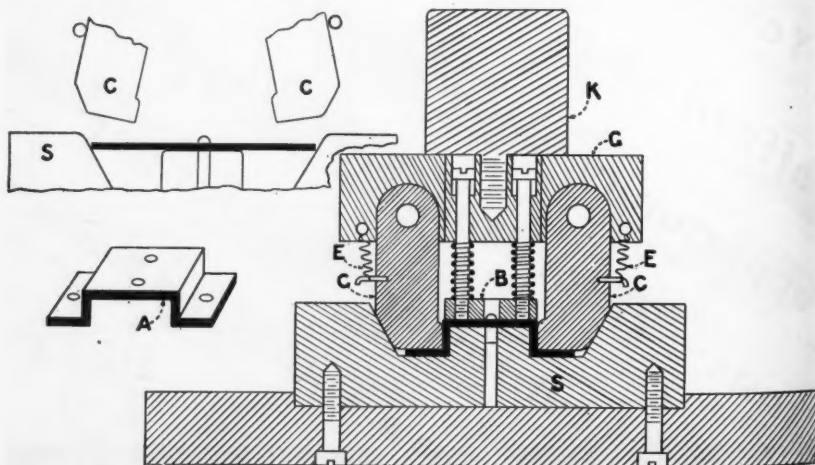
IN the course of a trip through a hardware specialty shop, recently, the writer saw a bending die of unique and interesting design. In discussing the die, one of the designers stated that the design employed is the best for producing work in which the sur-

faces are to be formed at right angles, due to the fact that the die in question forms the work and does not draw it.

A drawing of the work is shown at A. The piece is of half hard brass and contains four $\frac{1}{8}$ -in. holes. The piece is cut and pierced before forming. In the forming operation, the die works as follows: as the ram descends the pressure pad B holds the sheet firmly in place while the dogs C strike the work. As the dogs strike the angle of the forming die S, they are forced in toward the centre, carrying the ends of the piece downward and in with them. When the bottom of the stroke is reached, the piece is formed to shape as shown in the illustration.

When the ram is at the upward end of the stroke, the dogs are held apart by the springs E. The pins that hold the springs also serve as stops to prevent the dogs from spreading too far. It is interesting to note that the punch holder is made in two parts, the part K being screwed to the plate G.

It is granted that the type of die



Design of a die that forms to right angles without drawing

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described above may be more expensive to make than the type generally used for this job, but it will be found worth the cost where accuracy is required.

Finding Diameter of Work when Center is Inaccessible

BY PAUL C. BRUHL

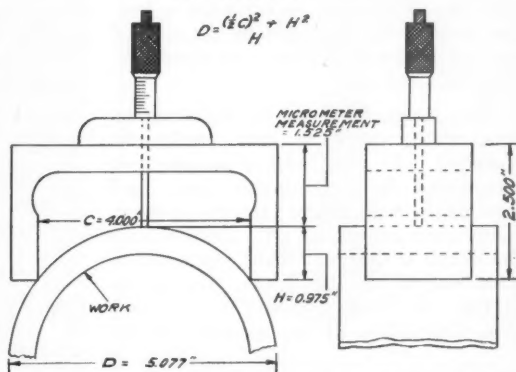
FINDING THE DIAMETER OF CIRCULAR WORK WHERE THE CENTER IS NOT ACCESSIBLE

THE drawing shows the design and dimensions of a device for determining the diameter of a circular piece where the center is not accessible. The device consists of a single piece of steel, machined accurately to the dimensions indicated, to which is added a depth gauge.

With this device diameters of between 4 and 8 inches can be determined accurately, although less than one-quarter of the piece projects so that it can be measured. With slightly less accuracy, diameters up to 16 in. can be determined. However, it is advisable to make the gap in the steel piece C 8.000 in. for the larger diameters and to increase the other dimensions proportionately.

To use the device, place it on the work to be measured so that it spans a section of the periphery, as shown, and adjust the micrometer spindle so

that it just touches the work. Take the reading to the third place and subtract this reading from the height of the gage, which is shown to be 2.500 in. on this gage, leaving the remainder which is indicated at H as 0.975 in. The dimension C, which is 4.00 in., remains constant. Now apply the formula:



Design of tool for obtaining diameters when center is inaccessible.

$$D = \text{Dia.} = \frac{(\frac{1}{2}C)^2 + H^2}{H}$$

Example: Reading as obtained with depth micrometer is 1.525 in. Gage height $2.500 - 1.525 = 0.975 = H$. $(\frac{1}{2}C)^2$ of the formula remains constant = 4.

$$\frac{4 + 0.975^2}{0.975} = 5.077 \text{ inches.}$$

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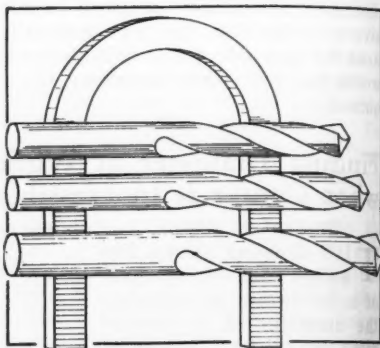
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A Handy Holder for Small Drills

By C. T. SCHAEFER

SMALL twist drills are easily lost or broken unless they are properly taken care of. Such drills should be kept in a holder that will both be easily reached and up out of the way, and the writer has never seen a better way to do this than by the use of an old magneto magnet, as shown in the illustration.

The magnet should be attached to the wall where it can easily be reached. It will hold a number of the small drills commonly used, and the drills will adhere to the magnet until they are pulled off. Care should be taken to keep at least one drill on the magnet at all times, preferably across the bottom, to aid in retaining the magnetism in the magnet. With-



An old magneto will hold the small drills until they are needed.

out this precaution, the magnet may lose its magnetic quality and thus becomes useless in a short time.

A Milling Machine Attachment for the Drill Press

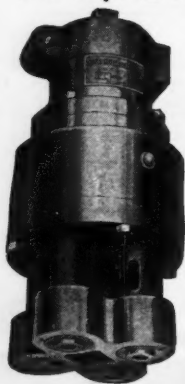
By JOHN McCULLAGH

THE primary use for which a tool is intended is not always its only advantage. If shopmen would always think of this it is surprising how many valuable improvised setups could be made—some of which are in the nature of “life savers”. In a pinch, I have seen milling machines used as drill presses, punch presses and wire formers, and not long ago it was called to my attention that someone had used a knee-type miller as a printing press.

Recently it was necessary to construct some flanges having twelve equally spaced holes around the outer edge. The flange, which can be seen in the illustration, was 2 in. thick and 10 in. in diameter. No expensive tooling was granted, yet the accuracy had to be within a tolerance of 0.005 in. between holes.

The operation was done in a drill

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press which, incidentally, was in good condition, by using a milling machine rotary indexing table. The work was located on four hardened spacers, which happened to be available, aligned from a centrally bored hole by means of a plug attached to the

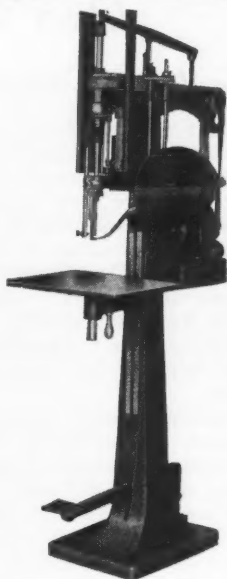


Holes can be spaced accurately by using a rotary indexing table with a drill press.

rotary table and clamped by two T-bolts.

The holes being finished were reamed to 11/16 in. diameter. First the holes were centered, then drilled, and finally reamed. The job was done within the specified limits without the construction of any special tooling—just by the use of a milling machine attachment which was loaned to the drill press department, a request which originated through the knowledge of available equipment.

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Over the Editor's Desk

"Miscellaneous Business"

REPORTS received from sales representatives of machinery dealers and from the sales organizations of a number of large steel manufacturers state that between 25 and 35 per cent of the total volume of orders received come under the classification of "miscellaneous business." And "miscellaneous business" usually may be interpreted to mean the smaller manufacturers who do not buy in huge quantities.

Information received from machinery dealers, in particular, indicates that a large percentage of the orders now being received are obtained from small or medium size concerns which, in boom times, were neglected for the large so-called "production plants." While business in general is much better than it was a year ago, a large number of the million-dollar concerns which in former years bought machines by the dozens and purchased steel in tonnage lots are now doing but a small percentage of their normal business while a good proportion of the smaller concerns are doing as high as 90 percent of their peak business. This state of affairs makes the little fellows as important from a marketing standpoint, right now, as the big ones.

We have actual, personal knowledge of small and medium-size firms who are doing a larger business today than they were in 1929, based on sales in dollars and cents. Some of the big firms who used to buy their materials in volume, direct from the mills, are now buying according to their needs through warehouses or mill supply dealers, and in many cases are not taking any more material than much smaller plants who manufacture the same types of products. At the same

time, the smaller plant is operating more profitably today, for reasons which were enumerated in a letter received from the sales manager of a machine tool firm. He said, in part, "If you have made a survey in recent months, you have found that there is a greater outlet for small tools as well as machine tools in the smaller shops than there is in the larger shops. . . . Due to their ability because of lower taxes, less insurance, and considerably less burden, many of the smaller plants are busy today when the larger shops are unable to compete."

The smaller plant, today, is occupying a position in industry that will compare favorably with that of the so-called "production plant." The majority of manufacturers of machinery, tools, equipment, and materials are now doing a profitable business in this field, and it should not be overlooked by those who are manufacturing to sell to this market.

Employment Increases

Payrolls in the automobile industry jumped 69.3 per cent in Michigan during October over the same month in 1932, and the number of employees increased 37.1 per cent. Employment in the machine and tool plants was up 234.6 per cent, despite labor disturbances. There were 142,526 more factory jobs in October this year than in October, 1932, it is reported.

Operations in the Kenosha plant of the Nash Motors Company were resumed November 22 after a shut-down of less than two weeks due to a labor dispute. Approximately 3,000 men were affected. The company is proceeding with its 1934 car program and has doubled employment in the Nash factories in Wisconsin.

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NEW SHOP EQUIPMENT

Norton No. D-85 Crankpin Grinder

The Norton Company, Worcester, Mass., has announced six new pieces of equipment, all of which will be on exhibition at the factory during the week of Decem-

The unit mounts a 42-in. diameter grinding wheel as standard and weighs over 3,300 lbs. complete with its slide-mounted motor. The wheel spindle bearings are flood-lubricated and the wheel-slide ways are force-feed lubricated with filtered oil.

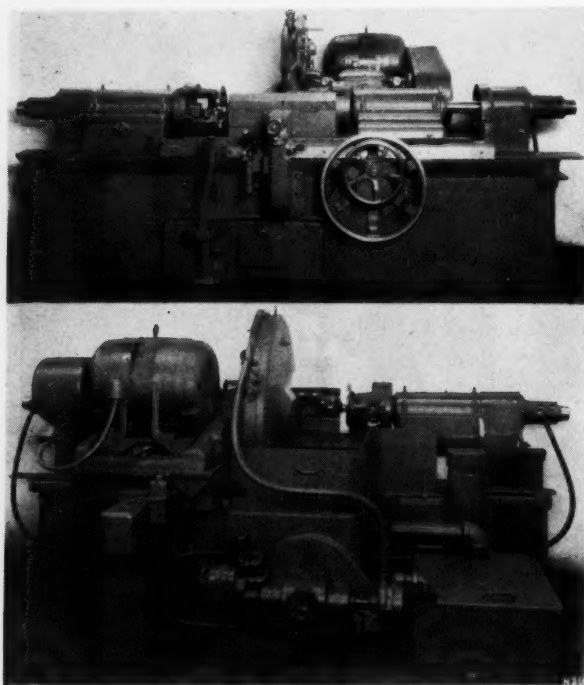
Two driving motors only are required;

one drives the grinding wheel direct by vee-belts and the other, which is within the base, drives the work from one end and the coolant and oil pumps from the other.

The machine is of the double-head type, both heads being used to drive the work. An adjustment for synchronization of the heads is provided. Both work head spindles run in long, large diameter bronze boxes. The wheel head traverse and feed, the table travel, and the opening of the work holder clamps are all hydraulically operated, the various levers being immediately under the operator's left hand as he stands in operating position.

One of the features of the machine is the interlocking arrangement of the main control lever. This lever governs (1) the opening and closing of the work-holder clamps, (2) the starting and stopping of the work revolution, and (3) makes inoperative the

table and wheel slide control levers. The work-holder clamps cannot be opened when the work is rotating and vice versa. Neither can the table be moved by power when (1) the work is rotating, (2) when the wheel-slide is advanced, (3) the steadyrest is in operation. In addition to the levers which control the power movements of the table and wheel-head, two hand wheels directly to the right of



Norton Model D-85 Crankpin Grinding Machine. Above is a front view showing the hydraulic steadyrest, and below is the rear of the machine with a shaft in grinding position.

ber 4. The six items are described and illustrated herewith.

The Norton D-85 Crankpin Grinder, shown on this page, is a large and powerful machine that has been developed for the automotive industry. With a swing of 17 in. and built in two lengths—28 in. to 40 in. and 40 in. to 52 in.—it uses the same wheel unit supplied with 20-in. and larger Type D roll grinders.

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Norton 10x36-in. Type C Cylindrical Grinder with Hydraulic Table Traverse and Hydraulic Power Wheel Head Traverse.

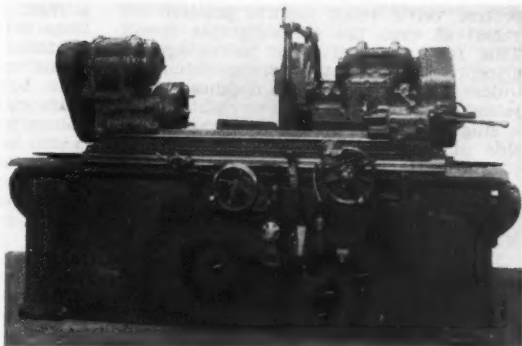
the operator's position are provided, the larger one for "jogging" the table to "split the spark" and the smaller one for feeding the wheel while grinding. The machine is regularly equipped with a grinding gauge, either of the customer's choice or, if desired, with the Nortonizer.

The steadyrest can be either of the elevating type, which swings clear of the work for loading, or the fixed type, which is permanently attached to the base and is hydraulically operated. The shoe leaves the work automatically when the wheel-head recedes. The shorter length machine weighs approximately 16,000 pounds with motors and requires floor space 8x15 feet.

Norton Type C Cylindrical Grinders

Norton Type C machines are built in two sizes, 10 in. and 16 in. The 10 in. size is available in standard lengths from 36 in. to 144 in. A wide variety of arrangements is available including hydraulic table traverse, mechanical traverse and hand traverse models. In addition 10 in. machines are available as semi-automatics and semi-automatic features can be built into hydraulic traverse machines if desired. Practically any model can be converted to any other of the same swing. This flexibility was designed to simplify the machinery buyer's problem and minimize the obsolescence factor.

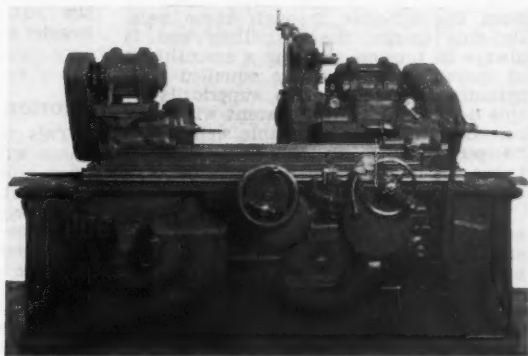
One of the outstanding features of Type C machines is the wheel unit with its slide-mounted motor driving the spindle directly by vee belts without idlers or intermediate shafts. The spindle bearings are flood lubricated, the oil passing through a



filter just before it enters the bearing. A spindle reciprocating attachment may be built in when the machine is purchased or added later should need for it develop. The unit complete with 15 h.p. motor weighs over a ton. Because of the large bearing area on the ways, however, this reduces to a unit pressure of approximately six pounds per square inch. In addition the ways are forced-feed lubricated assuring continued accuracy of alignment for practically the life of the machine.

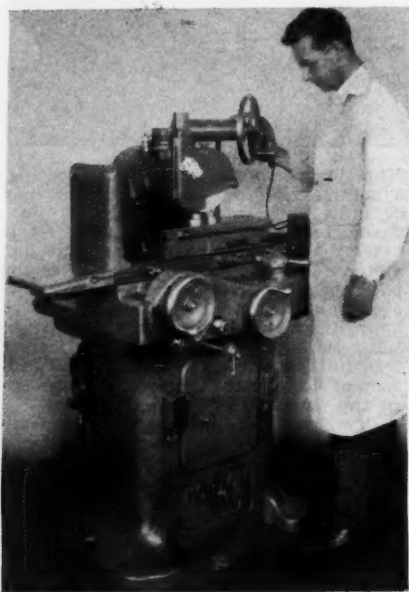
Two standard spindle speeds are available and, since the spindle sheave is mounted on the opposite end of the spindle from the grinding wheel, the change from one speed to another is quickly made with a minimum of effort. Changing sheaves involves no more work than changing grinding wheels. An automatic safety device prohibits mounting a full sized wheel unless the spindle speed is correct for such a wheel.

Hydraulic traverse machines employ a simple, distinctive and unique type of



Norton 10x36-in. Type C Semi-Automatic Cylindrical Grinder with Automatic Electric Sizing Device.

reverse valve which assures positive reversal at even the slowest table speed. This feature is of great advantage in grinding rolls or other work which requires highly reflective finishes. The table is propelled by two pistons in a single cylinder attached to the under side of the table. The tubular piston rods are attached one to each end of the



Norton 6x18-in. Surface Grinder

base and oil is admitted to and exhausted from the cylinder through these rods. By this design the propelling rod is always in tension assuring a smoothness of operation never before equalled in a cylindrical grinder. The superiority of this design is readily apparent when one considers that a considerable weight can be pulled with an ordinary piece of twine yet no weight can be pushed with it.

The reverse apron on mechanical traverse machines consists of a totally enclosed clutch operating in oil and which engages first one and then a second bevel pinion constantly in mesh with a bevel gear. Dash pot action of the clutch is obtained resulting in a quiet and positive reversal. The table is propelled by

a rack and pinion which is one of a train driven by the bevel gear. Changes in table speed are made with a speed frame consisting of a cone pulley and a gear box with hardened steel sliding gears running in oil. All type C machines are built with forced-feed lubrication of the table ways.

Semi-automatic machines are specialized, highly productive plunge-cut grinders available in any standard length and in any one of a wide variety of arrangements. Operation is very easy, the attendant simply loading and moving a single lever. They can be built with hand or hydraulic table traverse, live spindle or dead center headstock, hand or hydraulically operated footstock, with automatic mechanical or Nortonizer electrical sizing and for practically any external, cylindrical job within their capacity by the use of made-to-order fixtures which replace the standard work supporting units. Steadyrests can be hand or hydraulically and automatically operated. The headstock, footstock and steadyrests can be controlled individually or can be automatically operated as part of the cycle of machine functions.

With semi-automatics the grinding wheel is fed hydraulically, moving rapidly up to the work and then slowing down automatically to a grinding feed. When required, several different feeds can be provided, the change from one to the next slower occurring automatically. Hydraulic wheel head traverse is also available for other Type C models, a feature of particular advantage when grinding between high shoulders or flanges.

Ten-inch Type C machines in the 18-in. length weigh approximately 8000 pounds and require a floor space from about six to seven and a half feet wide by about eight feet long, the actual measurements and weight depending on the equipment. Larger machines are heavier and require more floor space.

Norton 6 x 18 in. Surface Grinder

This is a hydraulically operated machine with automatic cross feed, developed especially for tool and die shops or for light production jobs where small parts with accurate flat, plane surfaces must be produced. It is motor driven, completely self-contained, and equipped to take either a plain bronze or ball bearing cartridge type spindle. The spindle mounts an 8x $\frac{3}{4}$ in. grinding wheel, has a positive end thrust, and is driven by vee belts direct from the motor

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which is mounted on a platform on the vertical slide. If desired, an integral motor and spindle design is available.

The base is a single casting with vertical ways at the rear for the wheel head and horizontal ways on top for the saddle. The saddle supports the work table and houses the cross feed and table traverse mechanisms. There is a flat way at each end of the base and a guide way in the center, each being flood lubricated.

The work table surface is ground in place and has three standard $\frac{1}{2}$ in. tee slots. It travels in a forced-feed lubricated flat way and vee way at a maximum speed of 20 feet per minute.

A graduated hand wheel raises and lowers the wheel head by means of bevel gears and a ball bearing mounted feed screw. The pressed steel wheel guard has a hinged cover and an exhaust outlet. While the machine is arranged for dry grinding, wet grinding equipment can be provided without increasing floor space.

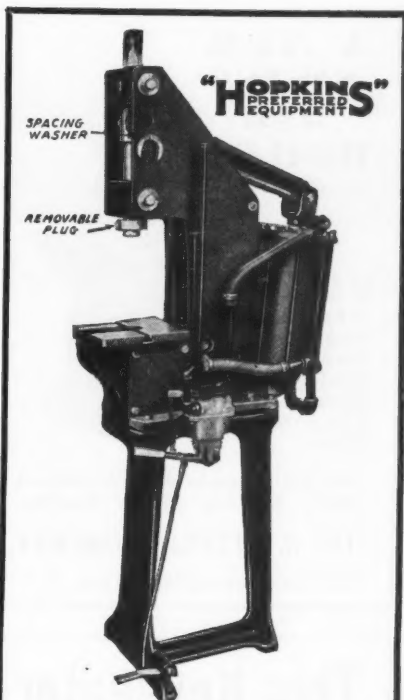
The hydraulic system is of the low pressure type, the pump and its driving motor being an integral unit mounted conveniently inside of a front cover plate. A very simple, piston type reverse valve is used and the table is propelled by a double rodless piston connected at each end and travelling in a cylinder attached to the saddle. The valve and cylinder are an integral unit, practically eliminating all piping. Starting, stopping and speed of the table are all controlled by a single throttle valve which is operated by a convenient lever on the front of the machine.

The automatic cross feed functions at each reversal or at alternating reversals and is adjustable from .010 in. to .090 in. It stops automatically upon completing a traverse in either direction. Simultaneously the table stops in the loading position.

Without motor and magnetic chuck the machine weighs approximately 1700 pounds and requires a floor space about four by six feet.

Norton No. 1 Tool and Cutter Grinder

This very handy and convenient little tool has the wheel drive motor mounted directly on the wheel head, driving the spindle by vee belts. The wheel spindle is of the cartridge type, plain bronze, ball or double-taper type bearings being available. The wheel is graduated horizontally and swivels through 360 degrees.



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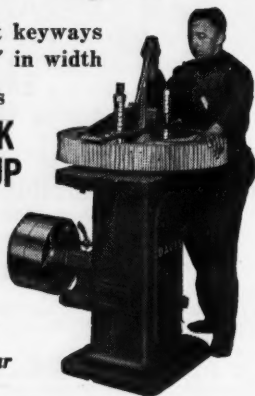
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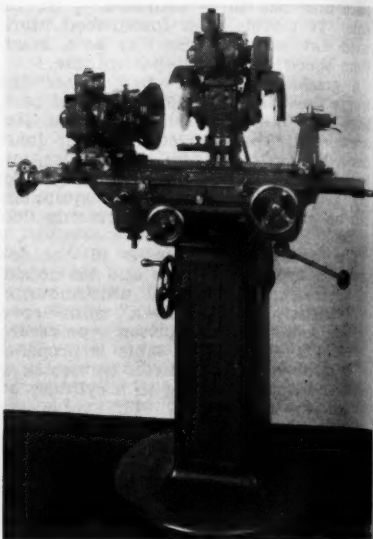
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A particular feature of this machine is its convenient arrangement. The base is a sturdy box casting of such size that the operator can straddle it conveniently while grinding. In addition a duplex feature permits operation from either front or back since the various hand wheels and levers can be mounted at either or both ends and either in front or back or both. The machine is supplied with one set of hand wheels and



Norton No. 1 Tool and Cutter Grinder

levers which can be transferred to corresponding positions on the opposite side. Additional levers and hand wheels can be obtained if desired. The wheel head elevating mechanism operates in anti-friction bearings, making operation up or down equally easy.

Supplied with the machine is a Universal Work Head which can be clamped to the table. It is graduated and will swivel 360 deg. horizontally and 200 deg. vertically. The spindle runs in anti-friction bearings and will take either National Standard milling cutter shanks or No. 12, 10, 9 or 7 B & S tapers. The head mounts either a three jaw or face chuck and provision is made for attaching a driving motor in a few minutes when it is used as a headstock. In addition to the horizontal and vertical graduations a separate set of graduations is

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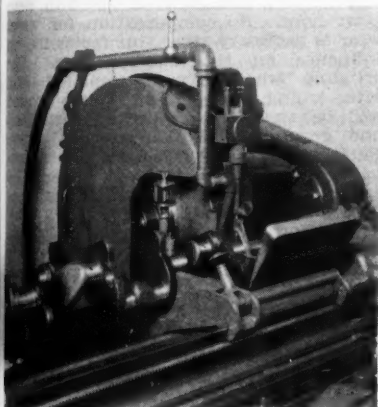
provided for use when setting clearance angles. A left-hand footstock can be supplied instead of the Universal Work Head if the latter is not required.

Attachments for internal and surface grinding operations are available and can be supplied when desired.

The machine swings 10 in. over the table and with the Universal Work Head takes 17 in. between centers. The work centers are 47 in. above the floor. With standard equipment it weighs approximately 850 pounds and requires a floor space three feet by five feet.

The "Nortonizer"

This automatic electric sizing device is one of the most unique pieces of equipment ever developed for a cylin-



The Nortonizer (Electric Automatic Sizing Device) in operating position on a 10x36-in. Type C Semi-Automatic Cylindrical Grinder.

drical grinding machine. The Nortonizer will stop the feed of the grinding wheel automatically directly from the work itself when the correct diameter has been produced, all the important machine functions being controlled electrically.

A gauge rides the work as the grinding wheel feeds in. When the correct diameter is produced, an electrical contact is made which stops the wheel feed and automatically lifts the gauge from the work. The wheel remains in contact with the work for a very definite and minute period which is controllable within extremely fine limits and then recedes rapidly to a position which facili-



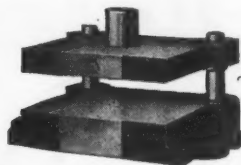
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tates rapid and safe reloading of the machine.

When used on semi-automatic machines, the starting and stopping of the work revolution, the rapid travel of the wheel up to the work and the feeding during grinding, and the operation of the footstock and steadyrest—if these units are used—are all controlled automatically. All the operator does is place the work in the machine, move a single lever with his right hand and simultaneously place the gauge on the work with his left. He need not be present when the work is finished and can operate as many machines with Nortonizers as the nature of the job permits.

Several distinct advantages are claimed for the Nortonizer. Inspection operations are virtually eliminated for work can be ground accurately round and well finished to a total limit of 0.0003 in. hour after hour. No compensation for wheel wear is necessary since this factor has no influence on the finished size. The grinding wheel can be replaced and, after truing, the very first piece ground will be an exact duplicate of the last one ground with the replaced wheel. Furthermore, the work need not be prepared for grinding to such close tolerances as for a machine which functions on a definitely timed cycle.

The Nortonizer can be applied to any new Norton cylindrical grinder and to practically all type A or BA machines now in service. Round work, splined work, keywayed work or partial diameter work can be ground.

Cam-O-Matic

The Norton Cam-O-Matic was developed especially for the automotive industry. It automatically grinds all the cam contours on a camshaft with fascinating precision, no attention from the operator being required after loading and starting. Upon moving the starting lever, the table moves over quickly until the first cam is in grinding position, the work starts rotating, the rocking bar lowers, the grinding wheel feeds in rapidly and then slows down automatically to a grinding feed.

When the cam is ground to size, the wheel moves back quickly and the table shifts, bringing the next cam into the grinding position and moving the master cam roller to the next master cam. These movements are repeated for each cam, and when the last one is ground, the table moves into the truing position, the grinding wheel is trued automatically

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at the same time compensating for the abrasive material trued away and the machine stops ready to be reloaded.

The Cam-O-Matic machine is in no sense an attachment for a standard grinder. It is a highly specialized tool for grinding automotive camshafts on a quantity production basis. It uses a Type C wheel unit with flood lubricated spindle bearings, forced-feed lubricated wheel-slide ways and mounted motor. The machine can be used for either roughing or finishing.

The Cam-O-Matic has a maximum swing of 6 in. diameter over the rocking bar and is built in three standard lengths taking 30 in., 36 in. and 42 in. between centers. Cams with a maximum lift of $\frac{3}{4}$ in. can be ground and when the wheel slide is withdrawn a 2 in. wheel will clear a $\frac{3}{4}$ in. diameter bearing or gear between cams. Master cams are furnished for either 24 in. or 22 in. wheels, a feature contributing to wheel economy where a battery of machines is used since 24 in. wheels worn to 22 in. can be transferred to machines equipped for 22 in. wheels.

In principle, the machine is similar to the Norton Integral Cam Grinding Attachment. A set of model cams is first

made by hand. From these cams master cams are generated and assembled on a spindle. During the grinding of the product (the cam as it is finished for the motor) these masters rotate at the same speed as the work. There is a master cam for each product cam and it rotates in contact with a master cam roller. The master cams and the work are supported by a rocking bar and as the master revolves in contact with the roller, the rocking bar, and consequently the cam being ground, is raised and lowered. This action causes a contour to be reproduced by the grinding wheel which is an exact duplicate of the handmade model cam.

The Cam-O-Matic with motors weighs approximately 13,00 pounds and requires a floor space about $6 \times 13\frac{1}{2}$ feet.

"Hisey" Wide Range Precision Grinder

The illustration shows the "Hisey" Wide Range Precision Grinder, which has been placed on the market by The Hisey Wolf Machine Co., Cincinnati, Ohio. The grinder is made in five sizes, from the $\frac{1}{2}$ h.p., which uses a 6-in. x $\frac{3}{4}$ -in. face grinding wheel, to the 5 h.p., which takes

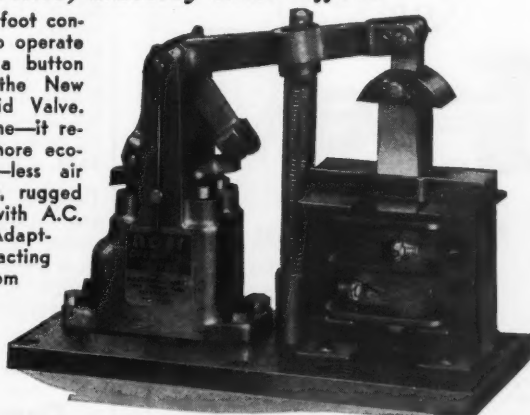
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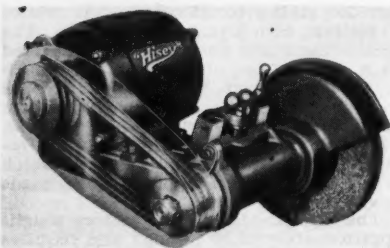
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a 14-in. x 2-in. face grinding wheel.

The machines are designed for a wide range of work in which accuracy is essential. They are readily adaptable for use with the lathe, planer, boring mill,



"Hisey" Wide Range Precision Grinder

or other machine tools, and can be used with any shape of wheel. The heavy, accurate construction makes them suitable not only for tool and maintenance jobs, but also for production work.

The constant speed motors used in these grinders enable them to operate at a practically constant speed under any load within their rated capacities. Not

dependent upon speed for power, special bonded wheels are unnecessary and ordinary vitrified wheels can be used with safety.

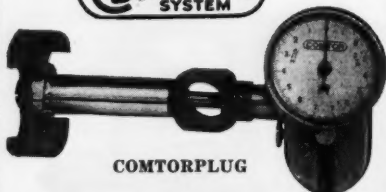
The design of the grinder provides several marked advantages, such as the amount of wheel wear that is possible due to the clearance afforded by the spindle housing. Spindle speeds are obtained by various ratios of pulleys and are not limited by the speed of the motor. The grinding spindle together with the motor can be swung end for end, so that grinding can be done either to the left or right of the machine. The direction of rotation of the wheel is reversible through the motor.

Matched pre-loaded precision ball bearings are used on the grinding spindle. The lubrication system envelopes all bearings in a mist of oil, regardless of the position in which the grinder is operated. Combination labyrinth and contact seals preclude any possibility of dust getting into the bearing chambers. All oil is automatically filtered.

The V-belt drive is said to transmit more than 99 per cent of the motor output without slippage. The machined motor slide base provides for rapid belt adjustment. Spindle speeds furnished as

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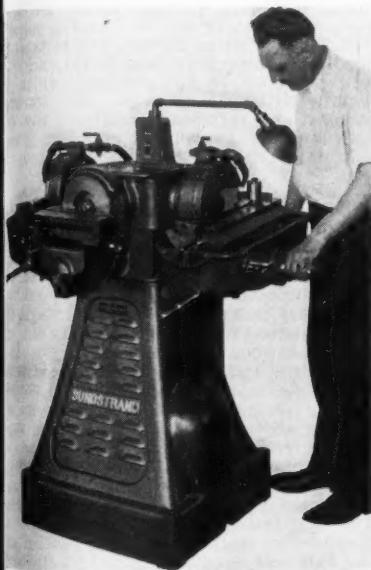
Commerce Pattern Foundry & Machine Co.

2211 Grand River Ave., Detroit, Mich.

standard are those recommended by the Grinding Wheel Manufacturers as being the most efficient for the various sizes of wheels. Extra pulleys to make available practically any speed can be supplied. The motor is balanced dynamically to insure high efficiency and smooth, vibrationless operation.

Sundstrand 3-Wheel Tool Grinder

A tool grinding machine, designed to make possible the grinding of tools at specific angles of rake and clearance and especially adapted for the grinding of cemented carbide tools, has been placed



Sundstrand 3-Wheel Tool Grinder

on the market by The Sundstrand Machine Tool Co., Rockford, Ill. The feature of the machine consists in that it is built with three spindles, to be equipped with a wheel for grinding high speed steel tools, a wheel for grinding cemented carbide tools, and a cast iron disk for honing. If desired, two spindles can be equipped to grind carbide tools, or for grinding high speed steel, correct spindle speeds being available as required.

The machine is of vertical type, a heavy pedestal with large base supporting the wheel-head rigidly at a con-

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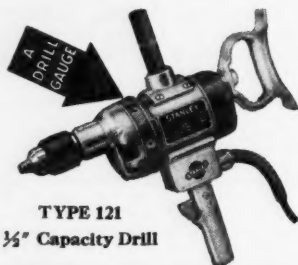


venient height. Solid steel bars of 3-in. diameter support the grinding and honing tables. The grinding tables are adjustable above and below horizontal through 40 degrees. A conveniently-located indicator shows the position of the grinding table above or below the horizontal, and a clamping lever is provided to lock the tables in the horizontal position. An accurate adjustment through 40 deg., with direct reading graduations, is provided for the honing table. Each grinding table has one T-slot for clamping tools.

Two 10-in. cup wheels are furnished as standard equipment, also a flat, true, and

uniform cast iron disc, 8 in. in diameter, for honing. Impregnated with diamond dust, the disc makes an accurate, durable, and free-cutting hone. Wheel spindles are of heat treated chrome nickel steel, and run in ball bearings. Two convenient handles on opposite sides of each catch basin provide for traversing tools across the faces of the cup wheels. Steel wheel guards are provided over both grinding wheels, with adjustable segment for right or left hand grinding.

A coolant tank with capacity of 6 gallons is supported in the rear of the pedestal. The pump supplies 4 gal. of coolant per minute at low pressure, through coolant nozzles which are adjustable for right or left hand grinding. The 3 h. p. driving motor, Vee belts, and coolant pump are all completely enclosed and protected in the pedestal, which is well ventilated. Wheels are started, stopped, or reversed simultaneously by means of a conveniently-located push button.



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Chuck Key held in housing always ready to use.

Universal Motor operates on AC and DC current.

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New Britain, Conn.

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Two new drive bases for electric motors—a vertical drive base designed to maintain correct tension, and a ceiling drive base that has all the advantages of a floor base—have been brought out by The Rockwood Manufacturing Co., Indianapolis, Ind. The Rockwood vertical drive base is similar to all other Rockwood drives in that the motor is mounted on two adjustable horizontal arms, suspended from a pivot shaft. In this adaptation, however, the weight of the motor is counterbalanced by two coiled springs, connected by rods to the bracket arms. The springs are adjustable, making it possible to maintain correct tension on the belt and thus eliminate belt slip and loss of power.

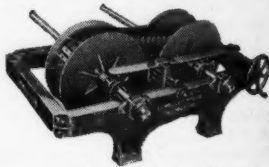
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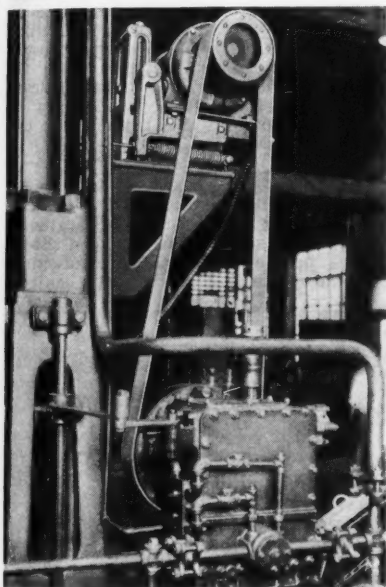
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COLUMBUS, INDIANA



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When the motor is located above the drive pulley, the springs are adjusted to support the entire weight of the motor plus the necessary belt tension. When the motor is located below the driven pulley, the springs are adjusted to support only that portion of the motor's weight not needed to provide belt tension. The adjustment is made merely by turning the two nuts at the ends of the coil-spring rods. Thus the tension may be established quickly and accurately by the machine operator, and may be instantly changed to meet different operating conditions.

To simplify the location of the motor



Rockwood Vertical Drive Base Applied to Hydraulic Pump Drive

relative to belt length at the time of installation and to provide adjustment for elongation of belt in service, the pivot shaft is moved vertically by means of convenient adjusting screws. This vertical adjustment for belt stretch and the use of screws in aligning the two pulleys are said to be exclusive features with this drive.

The fact that this drive can be adjusted to provide the correct amount of tension for either light or heavy loads, thus preserving the life of the belt, is



Universal Joints

(PATENTED)



Apex Universal Joints are time tested—simple in construction and exceptionally strong. No projecting ears, pins or screws. Diameters from $\frac{3}{8}$ " to 3". Can be machined to meet any requirement. Approved for Aircraft use.

Apex Universal Joint Socket Wrenches



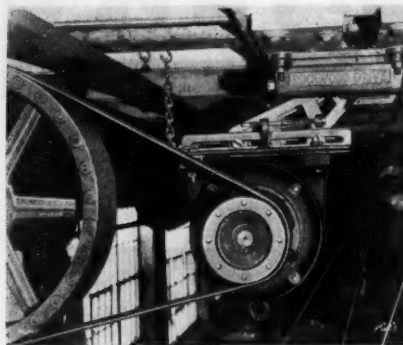
Apex Universal Joint Socket Wrenches for tightening nuts or cap screws in hard-to-get-at places are real time and money savers. Made in any size required for any electrical or air tool. Cannot over-travel their maximum working angle. Low first cost—long life—increased production.

Try Apex Universal Joints and Socket Wrenches. You will profit. Write for full information and catalog.

THE APEX MACHINE & TOOL CO.
THIRD & MADISON STS., DAYTON, OHIO

stressed by the manufacturer.

The Rockwood Ceiling Drive Motor Base provides for ceiling drives the same



**Rockwood Ceiling Drive Base Applied to
Lineshaft Drive**

full range of tension adjustment that is available with floor mounting bases, the adjustment being more conveniently made, however, than in the case of the usual horizontal drive. The ceiling drive base is quite similar to the standard

base, excepting that it has special hanger arms which suspend the motor horizontally and give greater clearance from the ceiling. The horizontal steel angles which move horizontally on the hanger arms are supported by a ledge cast on the bottom of the arms. This ledge carries the weight of the motor, taking it from the slotted-head screws in the arm slot. The screws can be loosened and the adjustable angles can be moved along the ledge simply by turning the secondary arm-screws while the drive is running; thus one man can make any desired change in belt tension.

The hanger arms have extra strength and rigidity, providing an extra margin of safety, and it is said that there is no danger that the motor will fall, either in operation or while being adjusted. A safety chain is included with the equipment, however, the chain insuring that the motor will not fall below its horizontal position even though the belt or fastener should fail.

Societe Genevoise Profile Projector

A new type of projecting apparatus for throwing on a screen an enlarged shadow of the profile of a small manufactured part, gear, screw, tap or cutter has been



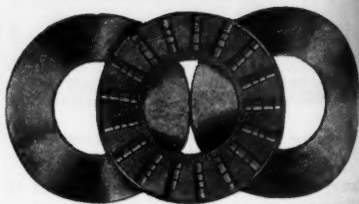
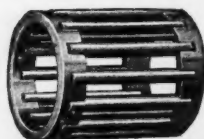
Have You Received Your Stock List "G"

645 stock sizes of Buckeye Bronze Bushings are listed with complete dimensions and prices in the new stock list "G". Every shop should have a copy of this list.

Write for your copy of Stock List "G" today. No obligation.

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6410 Hawthorne Ave.
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Special Bearings Made to Order.
Send Sketch or Sample for Quotation.

Catalog Upon Request

THE G WILLIAM CO.
358 Furman St. Brooklyn, N. Y.

introduced by the Societe Genevoise d'Instruments de Physique, of Geneva, Switzerland, and is being marketed in America by their representatives, The R. Y. Ferner Co., Investment Building, Washington, D. C.

This equipment differs from the usual projection apparatus in that the image is projected from below onto a heavy glass screen set in the top of a steel cabinet at a convenient angle for examination or measurement. By this arrangement there is no interference from shadows of the operator's head or hands or from measur-



Societe Genevoise Profile Projector

ing instruments. It therefore has an added use in that it can be used for tracing the design of any small article of which no drawing is available. It is also possible to make a photographic print of the profile.

With the special accessories and supports for articles to be examined it is possible to check a wide variety of pieces, such as taps, screws, cutters, pinions, ratchets and so on. Measurements can easily be made to 0.005 in., which is equivalent to 0.00005 in. on the object when using the objective giving a magnification of 100.

ATKINS SILVER STEEL SAWS

The BLUE END Blades cut
more metal than any other
hack saws made—bar none.



Buy them
from your
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tor—if he cannot
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are supplied promptly.

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AND COMPANY**

458 So. Illinois St., Indian'pls, Ind.

Anderson Improved Balancing Ways No Leveling Required

A simple and
excellent device
for balancing,
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and truing.

They are made in
the following sizes:

Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



Four chilled
iron discs
rotate on
sensitive
special
bearings

Write For Full Information

Mfd.
By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee Street, Rockford, Ill.

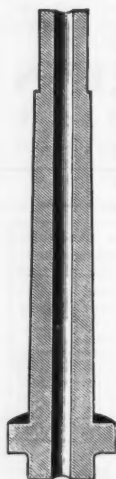
Four objectives are furnished which give magnifications on the screen of 10X, 20X, 50X and 100X, the magnification being accurate to 1/2000th. The change of magnification can be made in 20 seconds time, merely by sliding a second objective in place of the first one. The projector can be connected to 110-, 125- or 220-volt current. The lamp used above the object table and condenser is of the concentrated filament type.

For focusing of the image, the object table is adjustable in height by means of fast and fine motion devices. A support is provided above the table for a black curtain which makes possible the

use of the instrument in daylight, so that a dark room is not necessary. Photographic recording of the profile is also possible by the use of an adapter and plate holder surrounded by a black cloth so that it too can be used in daylight.

The useful area of the glass screen of the cabinet is 12½ in. by 15¾ in., so that with the objective giving 100 magnification, the maximum size of object is ¼ x 5/32 in. With the 50-power objective the dimensions of the object may be twice as great and with the 20-power objective they may be ½ x 25/32 in. Articles as large as 1¼ x 1 9/16 in. may be projected with the 10-power objective.

Your Inquiry . . .



. . . as to prices on high quality American Hollow Bored products may make important savings to you. Check up on your hollow bored forgings, steel shafting, and hydraulic cylinder costs.

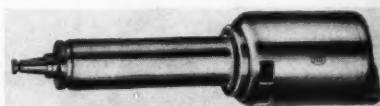
Write for complete data and prices.

AMERICAN
Hollow Boring Co.

2000 Raspberry St.
Erie, Pennsylvania

Ex-Cell-O Motor-Driven Spindle For Monarch No. 2 Surface Grinder

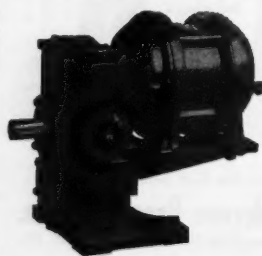
Ex-Cell-O Aircraft & Tool Corporation, Detroit, Mich., announces an inbuilt direct motor-driven spindle as standard



Ex-Cell-O Motor-Driven Spindle for
Monarch No. 2 Surface Grinder

equipment for the new Monarch No. 2 Surface Grinder.

The illustration shows a close-up view of the complete spindle. Both spindle and motor are enclosed in a common body, forming a complete unit. The spindle is equipped with two Ex-Cell-O Precision Ball Bearings that are especially developed for this type of service. Each bearing has been developed to pre-determined radial and end thrust limits and is equipped with balls selected for a high degree of accuracy, reducing friction in the bearing to a minimum and



CULLMAN SPEED REDUCERS

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Motors From 1/8 to 15 H. P.

NEW CATALOGUES ARE READY
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Cullman Wheel Company

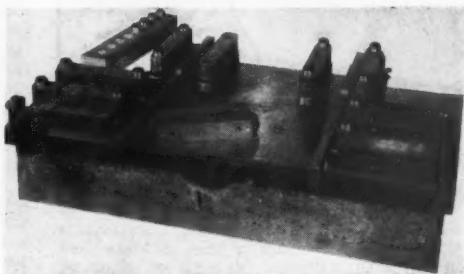
1336 ALTGELD ST., CHICAGO, ILL.

increasing its operating life. On the front or wheel end of the spindle a water guard is provided which keeps water, dirt and other foreign material from entering the spindle and causing the bearings to fail.

The electrical motor is rated at one horsepower, 3,500 r.p.m., on 60 cycle, three-phase, 220, 440 or 550 volt current, as required. Suitable ventilating openings are provided in the motor housing. An outlet box is located on the end of the motor to make the necessary electrical connections.

By mounting the spindle and motor on the same shaft and in one body, a compact and rigid unit is obtained. Vibration is reduced to a minimum and the operator is able to take heavier cuts and obtain better finishes with longer grinding wheel life at a minimum amount of power used.

punched without the necessity of making up expensive dies of the usual type. The universal perforating dies shown, which are made by The Strippit Corporation, 1557 Niagara St., Buffalo, N. Y.,



Strippit "Wales Type" Universal Perforating Dies

Strippit "Wales Type" Universal Perforating Dies

By making a templet to serve as a base, and using a set of the universal perforating dies shown in the illustrations, a wide range of work can be

consist of individual arms in which the punches and dies are carried as shown.

Each die consists of an upper arm in which is located a slidable stripping unit that carries the punch, and a lower arm carrying the die, the upper and lower arms being fastened together at the rear end to provide a throat to accommodate

A Complete Pattern Shop ... with the *ELECTRIC CARPENTER*

Machine shops, foundries or any metal manufacturing plant that make their own flasks and patterns will find the Electric Carpenter an indispensable requirement for the economical production of this type of work. Taking the place of seven separate machines and performing thirty-five complete wood-working operations while operating from the ordinary light socket, any kind of

maintenance and repair work can also be turned out—right in the shop. Adaptable for metal cutting by simply changing saws.

Write today for circular 265-A, describing this wonder machine in detail. No obligation. Convenient terms can be arranged.

Electric Carpenter, Inc.
Packard Building Philadelphia, Pa.



Electric
CARPENTER



"What company can supply all types of cemented carbides?"

the sheet or blank. The holders are made with different depths of throats, the deepest being 24 in., allowing holes to be punched any place in a sheet 48 in. wide. After the dies have been assembled to the templet, the complete assembly is placed in position on the bolster of any press and the ram is set to depress the punches sufficiently to perforate and clear the work.

Nothing is attached to the ram of the press, and it is not necessary to bolt the templet to the bolster; thus no die set-ers are required and the die is ready for operation practically the moment it reaches the press. To shift the die from one press to another consists simply in sliding it out of one and into the other.

With the proper clearance between the punch and die, the dies will punch and strip 10 ga. (0.1406) steel easily and, because of the perfect alignment of the

punch with the die, the possibility of burrs is practically eliminated. Lighter gauges the holes are especially clean and free from burrs. Punches to $\frac{1}{2}$ in. are considered as standard sizes are special.

The removal of a punch or stripping unit from the upper arm is accomplished instantaneously, the operation consisting merely of lifting the punch out of the stripping unit. The unit is a slip fit on the arm. If certain holes are to be made out of some of the parts in run, the punches can immediately be lifted out and the run continued.

A further advantage is that if only a few parts are to be run and no press available, the punches can be struck with a soft hammer. The toolroom can also use this method to check the accuracy of the templet.

Foote-Burt Continuous Broaching Machine

A horizontal type continuous broaching machine in which the broaching cutter is stationary and the work-pieces pass the broach in a continuous process has been developed by The Foote-Burt Company, Cleveland, Ohio. The machine, illustrated herewith, is of heavy and rigid design. The bed is of box type, heavily ribbed and cast in one piece.

The motor is direct-connected to worm shaft as shown in Fig. 2, power being transmitted through the worm and worm gear, then through the helical gear reduction to the driving sprocket, providing a smooth drive to the convey-

chain. Oil is carried by the drive housing, and the lower portions of the drive gears are submerged in oil, thereby lubricating the other all moving parts of the drive.

The work holding fixtures are assembled directly to the chain, the number of fixtures required being governed by the production desired and the size of the work. A fixture tunnel, through which the work pieces pass as they contact the broach, is mounted on the bed of the machine. Tool steel guides are mounted where the fixtures pass through the tunnel to provide the required support for the fixture and assure



Fig. 1—View of Foote-Burt Continuous Broaching Machine From Operating Position

Fig. 2—

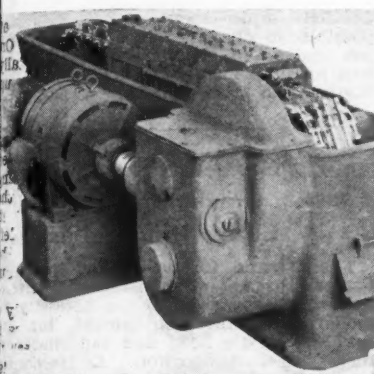


Fig. 2—Rear of Machine, Showing Motor

necessary rigidity. The broach holder is made with adjustable wedges which not only provides an easy method of setting the broaches to cut, but also allows for compensation for the metal removed when the broaches are reground. The fixtures are usually of the automatic clamping type, the operator being required only to drop the work into the fixtures. A cam guide locates the work in the proper position and the fixture is automatically locked.

After the fixtures pass through the tunnel, the work pieces are automatically released and fall into the work chute. The fixture shown in the illustration is for holding connecting rod caps, each cap being placed so that it will rest on the two steel buttons which contact the two back bolt bosses. The fixture is of the vise type, the drive side of the jaw being the solid part of the fixture and acting as a support to the work, while the other jaw, which is moveable, is actually driven by a wedge for locking the cap in place. Should the operator be careless in placing the work in the fixture, the uneven position of the work-piece will cause it to strike the guard and thus actuate an automatic switch which will immediately stop the machine.

The entire length of the broach holder is flooded with oil so that both work and tools are properly lubricated and the chips are washed from the broach-teeth. Provision is made for removing the chips from the machine and a chip conveyor can be installed where required.

The long length of the broach makes possible a large number of teeth, thus lightening the cutting load on each tooth and adding to the life of the tool. The broach will average about 50,000 cuts per

grind. To grind the broach, the sections of which the tool is composed are removed from the holder and the surface of the teeth is ground in a surface grinder.

The work-pieces shown in process in the illustration are connecting rod caps, forged from tough steel. In this operation approximately $\frac{1}{8}$ in. of metal is removed. Production, 1800 pieces per hour.

The machine is available in three sizes: No. 5, with a capacity of 5 h.p. and a maximum broach length of 30 in.; No. 10, capacity 10 h.p., maximum broach length 60 in., and No. 15, capacity 20 h.p., broach length 75 inches.

Which Type of Cemented Carbide Is Best for Your Jobs?

There is a correct type and grade of cemented carbide for all of your machining work within the range of practical carbide application, but to try each kind out in your plant would be costly and inconvenient. However, there is an economical solution to this problem: Carboloy Company, Inc. makes all types of cemented carbides. When you specify "Carboloy" you *automatically* receive the type of cemented carbide which past experience has shown to be best for your job, whether it be tungsten carbide, tantalum carbide, titanium carbide, or any other type combining these or other carbides. Carboloy Company, Inc., 2485 East Grand Boulevard, Detroit, Michigan.

"You're looking for the Carboloy Co. of Detroit. They specialize in all types of cemented carbides"



No. 61 Hercules High Frequency Grinder

The Buckeye Portable Tool Company, 29 West Apple St., Dayton, Ohio, has placed on the market another new tool of the high-frequency electric type—the



No. 61 Hercules Portable Grinder

No. 61 Grinder, built in two speeds; 3800 r.p.m. for use with 6 in. vitrified emery wheels and 5400 r.p.m. for use with 6 in. elastic bonded emery wheels. The 3800 r.p.m. tool can also be used with 8 in. elastic bonded wheels.

The outstanding features of these tools are the cool running motor, the stream line ventilation system and the mounting of the stator on insulating pads within the motor housing, resulting in an extremely low temperature rise in operation and thereby increasing the efficiency of the tool.

The Hercules plug-in cable is another

decided improvement, as it makes it possible to change cables right on the job instead of sending the tool to the tool room to have a new cable installed, saving both time and money.

Geometric No. 10 Chaser Grinder and Universal Chaser Grinding Fixture

The demand for better and more accurate threads is constantly increasing, which means that the necessity for modern, accurate equipment for the grinding of die head and tap chasers is increasing in proportion. As its contribution toward the meeting of this demand, The Geometric Tool Co., New Haven, Conn., has developed the No. 10 Chaser Grinder and the Style E Universal Chaser Grinding Fixture.

With proper fixtures, the grinding machine will sharpen any kind of die head or tap chaser—milled, tapped, circular or tangent, within its capacity. In addition, because of its longitudinal, transverse, and vertical travel, it is adaptable for other tool grinding work.

Always Specify . . . Good Gears

You will profit by always specifying GOOD GEARS . . . gears that are correctly hardened, accurately ground, and finely polished to insure lasting quality. Use PERKINS GEARS consistently. Send blue-prints for estimates.



A Helpful Catalog

Many pages in the Perkins 192 page catalog contain tables and gear calculation data. Mechanical executives and designers find this catalog extremely useful.

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MODERN MACHINE SHOP is the **ONLY** magazine in the metal-working field showing an increase in advertising over the corresponding months of last year.

Here are the figures:

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- Oct. 1933 issue shows 60% gain over Oct. 1932
- Nov. 1933 issue shows 78% gain over Nov. 1932
- Dec. 1933 issue shows 65% gain over Dec. 1932

These figures are important to **YOU**.

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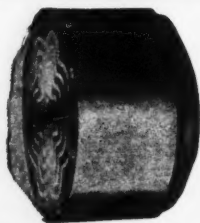
MODERN MACHINE SHOP belongs on your 1934 schedule of advertising.

MODERN MACHINE SHOP

CINCINNATI, OHIO

"The most widely read metalworking magazine in the world."

Standardize ON D & W Chucks



STANDARDIZATION pays, particularly when the tool is as far ahead of its class as the D & W chuck. Oil and waterproof, it is designed and constructed to give maximum holding surface with exceptionally strong and uniform pull throughout. Cables are protected by rubber tubing—special demagnetizing switches for readily releasing the work.



Complete
information
on request.

**J. & H. ELECTRIC
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AMES GAUGES

Made in a variety
of sizes and styles.

Send for
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Would You Like to Get "Stampings"?

Our own bi-monthly magazine on stampings, washers and arbor spacers will be sent to you on request. Valuable information is yours for the asking.

Detroit Stamping Co.

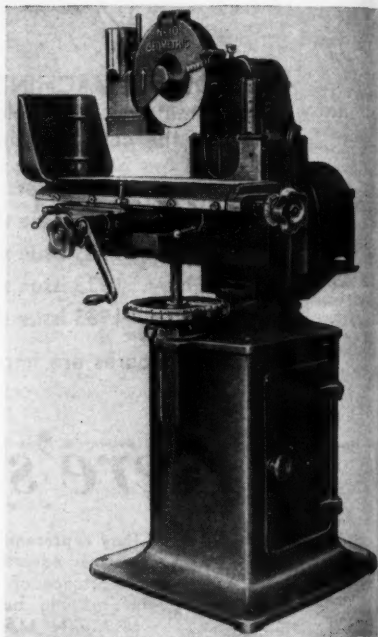
Est'd 1915

3445 West Fort Street, Detroit
Washers—STAMPINGS—Arbor Spacers

STAMPINGS



The machine is built with a heavy column and sturdy knee, mounted on a solid, removable base to permit mounting on the bench if required. It is made of semi-steel castings, carefully scraped in. Controls are readily accessible. A geared rack and pinion provide for rapid speeds. Micrometer table adjustments are provided for fine feeds, and scales



Geometric No. 10 Chaser Grinder

indicate the diameter of the wheel and the vertical table travel. The elevating screw is equipped with a ball thrust bearing. Wheel and table are amply guarded and provided with an exhaust hood for the blower attachment. The spindle is fully enclosed to keep out dust and dirt. Enclosed motor or overhead belt drive furnished as desired. The machine is suitable for magnetic chuck or mechanical holding devices.

The work table is $26\frac{3}{4} \times 6$ in., and has two 9-16-in. T-slots. It has a longitudinal travel of 15 in. and transverse travel of $5\frac{1}{4}$ in. Vertical table travel is 9 in. The maximum vertical clearance between wheel base and table is $13\frac{1}{2}$ in., minimum, $4\frac{1}{2}$ in. Diameter of grinding

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wheel, 9 in. Floor space required, 4 ft. 5 in. x 4 ft. Net weight, without motor, 875 pounds.

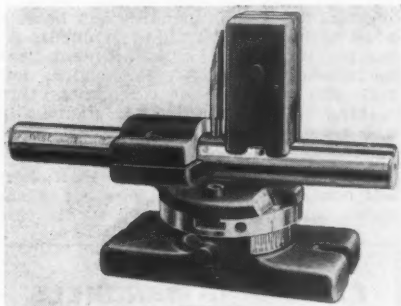
Geometric Style E Universal Chaser Grinding Fixture

By using the Geometric Style E Universal Chaser Grinding Fixture, all types of chasers can be ground on both the chamfer and cutting face. Both right and left hand chasers may be sharpened with equal facility. The fixture can be used either on the Geometric No. 10 Chaser Grinder or on any similar grinding machine. To grind tapped die head chasers and collapsing tap chasers, however, the machine should have longitudinal and vertical adjustments. To grind milled chasers, it should also have transverse adjustment.

The Style E fixture has been approved over the previous Geometric fixture by the addition of a plate which permits the fixture to be offset, thus giving the proper chamfer clearance for tapped (hobbed) die head chasers or collapsing tap chasers. The offset plate is equipped with opposing adjusting screws so that fine adjustment may be made and then

the whole locked solidly in place, thus permitting easy duplication of grinds.

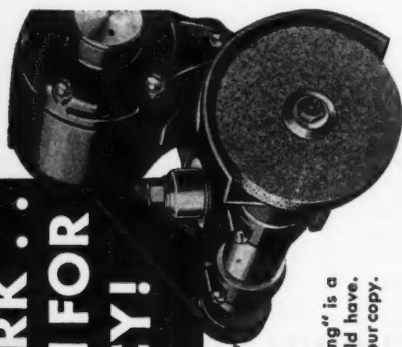
One holder for one tool size of Geometric chaser is furnished with the fix-



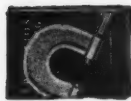
Geometric Style E Universal Chaser Grinding Fixture

ture, and additional holders may be obtained from the manufacturer. Other makes of chasers may be ground by making slight changes in the holder.

**A BEAR
FOR WORK...
A DEMON FOR
ACCURACY!**



"Precision Grinding" is a manual you should have. It's free. Ask for your copy.



Whether internal or external precision grinding is to be done — whether for production or tool room work — one of the ten different types and sizes of DUMORE Grinders will handle your job. The 1/2 H.P. No. 5 Grinder illustrated is the most popular size. Write for the name of the DUMORE dealer who will demonstrate it.

THE DUMORE COMPANY, 28 Sixteenth St., Racine, Wis.

DUMORE
GRINDERS

J. & L. Pedestal-Type Comparator

The Jones & Lamson Machine Company, Springfield, Vermont, has added to its line of projection machines a new Pedestal Type Comparator and Measuring Machine. This machine can be supplied without measuring attachments for comparing objects, or attachments can be furnished to provide for vertical, lateral and angular measurements, thus making it a fully universal comparator and measuring machine for tool room, production or laboratory inspection use.

The machine is rigidly constructed, self contained, with all operating mechanism conveniently arranged within easy

reach of the operator when sitting before the 14-in. diameter chart.

The supporting base is of substantial construction with two large bearings for supporting and guiding the 3½-in. diameter ram on which the table is mounted. The upper portion of the ram is threaded and is encased in a 12-in. diameter ball thrust handwheel for vertical adjustment. The maximum vertical table travel is 6 inches.

The hood, supported on the top of the column, encases the mirror and supports the screen and projection lens. The lamp house carries a 50 candle power Mazda lamp. It is supported on a pedestal mounted on a bracket which pivots directly under the lens system. By swinging the bracket and adjusting the lamp house, the light beam can be thrown parallel to the helix of a screw thread or hob tooth.

Three styles of tables can be furnished for use with the machine: A plain table without lateral adjustments, table with 4-in. lateral adjustment for measuring 4 in. of spacing or lead, or a table with 10-in. lateral adjustment for measuring 10 in. of spacing or lead.

All three styles of tables can be swiveled 15 degrees either side of center. Centers with standard center blocks will stage objects up to 5 in. dia.

A vertical measuring attachment can be supplied for measuring vertically up to 21 in. This attachment is made up of an indicator attached to the main casting and an anvil attached to the ram. The anvil and indicator plunger are in axial alignment and the anvil can be adjusted vertically to set the indicator at zero. The table carrying the object is adjusted vertically and a size block is placed between the anvil and indicator for comparing the movement of the shadow on the chart with the thickness of the gage block.

For measuring angles, a vernier attachment is supplied. This vernier, working

"NICHOLSON" EXPANDING MANDRELS



THEY act like a four jawed chuck, expanding in the bores of collars, bushings, gears, pulleys, etc., and holding them securely while being machined in a lathe, miller, shaper or grinder. For bores from ½" to 7".

W. H. NICHOLSON & COMPANY
136 Oregon Street Wilkes-Barre, Pa.

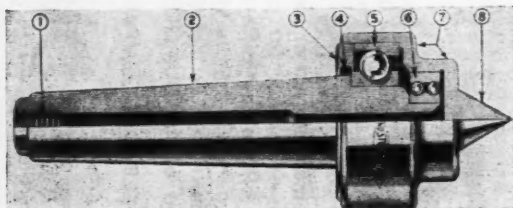
The Mummert-Dixon Spot Facer



... enables you to machine accurate and smooth surfaces on small bosses, etc., in less time than by any other method. Better investigate! Send for a bulletin.

MUMMERT-DIXON CO. 120 Philadelphia St.
HANOVER, PA.

HEAVY DUTY STURDIMATIC LIVE CENTER



STURDIMATIC TOOL COMPANY

Order on Trial!

It is new! Made in response to manufacturers' demands. Sturdimatic live centers have what you want. Write for catalog No. 433.

Write for Catalog No. 433

5222 Third Ave., Detroit, Mich.

in conjunction with the graduated 16%-in. diameter ring, permits accurate measurement of angles in degrees and minutes.



Jones & Lamson Pedestal-Type Comparator

A standard 8x10-in. photographic attachment can be supplied for photographing directly on sensitized paper, film, or plates. As the hood with this attachment is light-tight, photographs can be taken under ordinary shop lighting conditions.

The following lens systems can be supplied for projecting objects of various sizes:

- 25 m/m lens system will project 5/64-in. areas at 200 magnifications.
- 38 m/m lens system will project 11/64-in. areas at 100 magnifications.
- 48 m/m lens system will project .200-in. areas at 62½ magnifications.
- 46 m/m lens system will project 9/16-in. areas at 20 magnifications.
- 82 m/m lens system will project ¼-in. areas at 12 magnifications.

This machine, when equipped with attachments providing for vertical, lateral and angular measurements, is fully universal for measuring or comparing.



Flexoid Couplings

Write for circular.

Smith Power Transmission Co.

1213 W. Third St., Cleveland, O.

SPEED

½ to 150
K.V.A.

SPOT WELDERS

Made foot operated and automatic motor drive for welding from .0005 in. to ¾ in. combined thickness.

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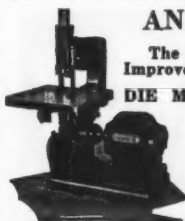
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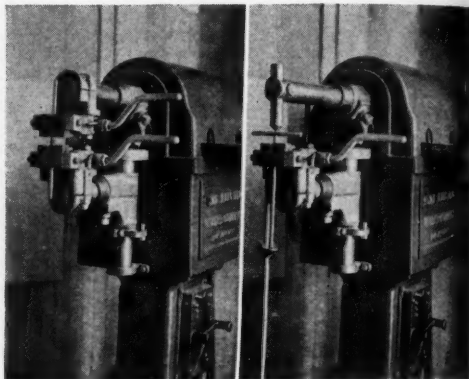
Butt and Tee Welding Attachment For Electric Welder

By the use of an attachment which is being marketed by the Acme Welder Company, 5623 Pacific Blvd., Huntington Park, Cal., an electric spot welder can easily be adapted for tee or butt welding. The attachment is said to be especially valuable in the manufacture of bird cages, refrigerator shelves, oven shelves for gas ranges, and so on.

For tee welding, one attachment is used on the lower horn of a spot welder as shown at the right in the illustration. The left illustration shows the welder arranged for butt welding, for which two attachments are used—one on the lower horn and one on the upper.

The attachment is constructed of a special tough bronze with solid copper reversible and replaceable die blocks. All of the moveable wearing parts, such as the pivot stud, cam, cam face plate, and so on, are of hardened steel. The jaws will accommodate any size wire from No. 16

gauge up to half-inch diameter and can be quickly adjusted to the size required. The jaws are actuated by a cam on the offset handle, which design provides for fast operation and rigid clamping.



(Left)—Acme spot welder with attachments applied for butt welding. (Right)—Tee welding can be done with a single attachment applied to the lower horn of the welder.

All parts are reversible; thus the attachment may be operated either right or left hand or upside down. An adjustable height stop is furnished, and the attachment is drilled and tapped so that side stop fixtures may be speedily installed. Both in design and manufacture, the attachment is rugged and fool-proof.

"Thor" Boiler Shop Drill

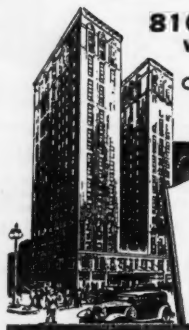
The Independent Pneumatic Tool Co., 600 W. Jackson Bl., Chicago, Ill., is now building a "Thor" rotary-type tool especially designed for boiler shop use. The tool, which is shown in the illustration, is built to eliminate rough and unbroken threads and leaky staybolts so often

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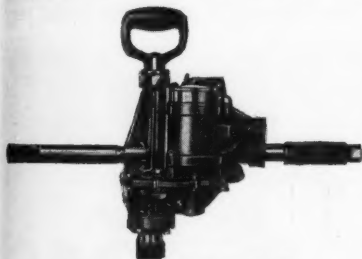
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found when tapping staybolt holes with a piston-type drill.

The tool is equipped with power blades instead of connecting rods and the usual pistons and crankshaft. It operates smoothly and easily, causing no jerking or jarring effect on the workman. It has governor-controlled air consumption and speed, preventing the motor from racing



"Thor" Boiler Shop Drill

when starting the tap. It is said by the manufacturers to be the fastest and lightest staybolt tapping and flue-rolling machine ever designed. The tool has a drilling and reaming capacity of up to 1 1/4 in., weighs 28 lbs., has a speed of 210 r.p.m., and is 12 in. in length.

New Motor Driven "Deckel" Universal Tool Milling Machine

The Index Machinery Corporation, 49 Central Avenue, Cincinnati, Ohio, is now marketing the "Deckel" Universal Tool Milling Machine shown in the illustration.

The extreme flexibility of the machine and its sturdy construction make it adaptable to a very wide range of work. The vertical milling head is mounted in the same bearing as that used by the prism-

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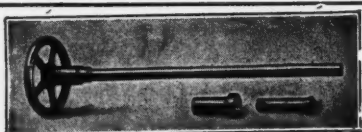
Chronometer-like accuracy is only obtained by the finest construction. The precision of Federal Model 16 (for exceptionally close work) on which .0001" reads like .001" on ordinary gages, is obtained by the use of jeweled bearings, stainless steel racks, gears and pinions, unit movements independent of the case and other exclusive Federal features.

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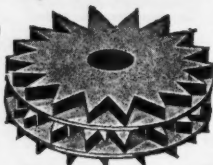
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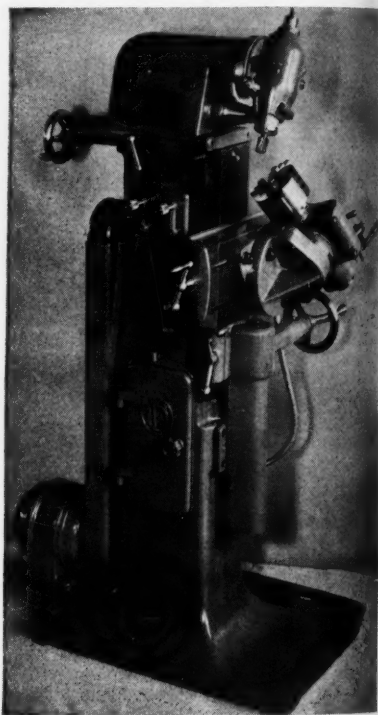


(Alexandrine West Near Woodward)

DETROIT

shaped overhanging arm, and the drive for the vertical head is through a gear directly from the center of the main horizontal spindle. With the vertical head in place, the machine has the appearance and rigidity of the conventional type of vertical milling machine and its utility, therefore, covers both classes of work, vertical as well as horizontal.

The universal horizontal table swivels in four directions and lends itself very



Deckel Universal Tool Milling Machine

effectively to angular milling work, since rechucking or reclamping is eliminated in many instances and errors are thus avoided.

The dividing head may be mounted in a horizontal or vertical position, and through the flexibility of the universal horizontal table almost every angle or position can be obtained. This feature is very useful in the milling of punches and dies or molds of various kinds, which are held in a chuck on the dividing head. Particularly effective is this feature when

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it is required to cut gear teeth or other accurately-spaced divisions in a tool, a part of which is irregularly shaped.

The dividing head is arranged for direct or indirect dividing, direct through a 12-division index plate and a dial graduated in degrees; indirect, through three regulation index plates. The dividing head is further equipped with an overhanging arm or arbor support for use in various kinds of milling, such as reamers, taps, gears, and so on. Special equipment, such as a circular table, universal vise, measuring stops, punch milling attachment and copying attachment can be supplied.

The "Deckel" mill is equipped with automatic feeds for both vertical and horizontal movements, with 6 changes by change gears. The Vertical Head Spindle and the Dividing Head Spindle are bored for a No. 4 Morse taper, the same as the main horizontal spindle, and the three spindles are equipped with adapters for the use of spring collets. The working surface of the horizontal table is $10\frac{1}{2} \times 18$ in., and the weight of the machine is approximately 1400 pounds.

Stanley Electric Woodworker

Any shop in which any amount of woodworking is done, as in the pattern department or packing room, will find a useful piece of equipment in the Stanley Electric Router and Shaper. The machine consists of an electric power unit and any one of a number of tools or attachments. The motor unit contains a compact $\frac{3}{4}$ h.p. Universal motor, 110 volts, to run at 18,000 r.p.m. The chuck is mounted on the armature shaft, eliminating the use of belts or pulleys.

With the power unit and the necessary attachments, the machine can be used for dovetailing, routing, dadoing, beading, fluting, mortising, rabbeting,

shaping, or any other woodworking operation.

The shaper is designed so that small diameter cutters may be used for large cuts, the small diameters making possible greater power at the cutting edges. A bench plate makes it possible to use a work bench as a shaper table, or a combined bench router and shaper is avail-



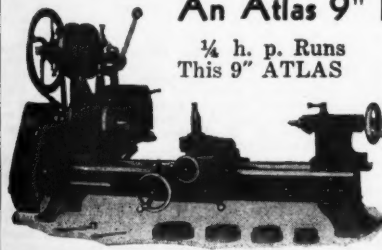
Stanley Electric Router and Shaper

able. Power for the unit is obtained from any light socket, and either alternating or direct current may be used.

SCHWERDTLE STEEL STAMP BULLETIN. The Schwerdtle Stamp Company, Bridgeport, Conn., has issued a 4-page folder containing full descriptions and illustrations of the steel hand stamps, steel letters and figures, hammer stamps, roller dies, embossing rolls, steel press stamps, embossing dies, and other products of this company. Copies may be obtained by addressing the firm as above.

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Chucks—Key and Keyless: Bulletin No. 120A, 632, and 633, issued by T. R. Almond Mfg Co., Ashburnham, Mass., describe and illustrate the line of key and keyless geared nut and ball bearing drill chucks made by this firm. Copies free upon request.

Ames Dial Gages: Dial gages, gage heads, cylinder gages, dial thickness gages, dial micrometers, and special gages and attachments made by the B. C. Ames Company, Waltham, Mass., are described and illustrated in Catalog 50. Write for copy.

Scraper by Power: Bearing surfaces can be scraped with a power scraper that is quicker and easier than the antique hand method. Write for information to Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine & Tool Co., 200 Davis Avenue, Dayton, Ohio. Sent free upon request.

A New Deal in Hacksaw Blades: "Blue End" Hacksaw Blades reduce costs by cutting faster and lasting longer. Write for data and prices to E. C. Atkins & Co., 402 S. Illinois St., Indianapolis, Ind.

"Atlas" Bench Lathe: A 9-in. screw cutting, self-contained, motor-driven bench lathe is now being built by Atlas Press Co., Kalamazoo, Mich. Write for circular.

Irregular contours on dies or tools can be finished accurately and fast by the use of the No. 2 Baker Grinder. Write Baker Brothers, Inc., Toledo, Ohio, for descriptive bulletin.

"Ground-From-The-Solid" Taps: Bath taps are hardened in the solid, then the teeth are generated by grinding, producing absolutely accurate taps. Write for the "Ground Thread Handbook", free. John Bath & Co., Inc., Worcester, Mass.

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less Grinding Co., 6538 Carnegie Ave., Cleveland, Ohio.

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Davis Keyseaters: The newest methods of keyseating are discussed in a bulletin that also describes and illustrates the keyseating machines made by the Davis Keyseater Co., 250 Mill St., Rochester, N. Y. Copy free upon request.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Huntington, Desmond-Sherman, Zie-24, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Steel Spacing Washers: Milling jobs can be set up quicker by using standard spacing washers, made by Detroit Stamping Co., 1345 West Fort Street, Detroit, Michigan. Write for information.

Assembly by Power: A power screwdriver that will set and screw in machine screws at a rate of from 400 to 500 screws an hour is described in a folder that can be had by writing to the Detroit Power Screwdriver Co., 5365 Robins St., Detroit, Mich.

Special Quills for Precision Grinding, made by The Dumore Company, 28 Sixteenth St., Racine, Wis., are described and illustrated in a booklet that can be had by addressing the firm mentioned.

Self-Opening Die Heads for all types of machines in which threading is done are described and illustrated in a catalog that has been issued by The Eastern Machine Screw Corporation, 140-150 Truman St., New Haven, Conn. Copy free.

"Speed" Spot Welders for welding metals from 0.0005 in. to $\frac{1}{8}$ in. thick are described in a catalog that can be had by addressing Eisler Electric Corp., 761 South 13th Street, Newark, N. J.

The Complete Pattern Shop: A machine that will saw wood or metal, drill, or turn pattern materials is described in a folder that can be had by writing to Electric Carpenter Co., Philadelphia, Pa.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, dial comparators, and other precision gages made by Federal Products Corporation, Providence, R. I., are described in a booklet that will be sent free upon application.

Performance Data On Swiss Jig Bore: This 36-page pamphlet shows various types of jobs from a power shawl turntable fig to a television disc, drilled and bored on Societe Genevoise High Speed Precision Bore, giving data as to size of holes, accuracy and time savings. Free upon request to The R. Y. Ferner Co., 1008 K Street, N. W., Washington, D. C.

Stampings of any kind or size can be obtained from Greling Brothers, 5 East Third Street, Cincinnati, Ohio. Write for particulars.

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Stamp with Numeral: The complete set of figures or letters all combined in one tool, preventing loss of single letters or digits. Write for catalog. Numeral Stamp & Tool Co., Huguenot Park, Staten Island, N. Y.

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Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitzburg, Mass.

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Chuck With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tompkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

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Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, surface grinders, toolpost grinders, and bench and floor grinders is described in Catalog No. 33, published by The United States Electric Tool Co., 2471 West Sixth Street, Cincinnati, Ohio. Copy free.

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